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1924

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Full Denture Prosthesis—*Campbell*

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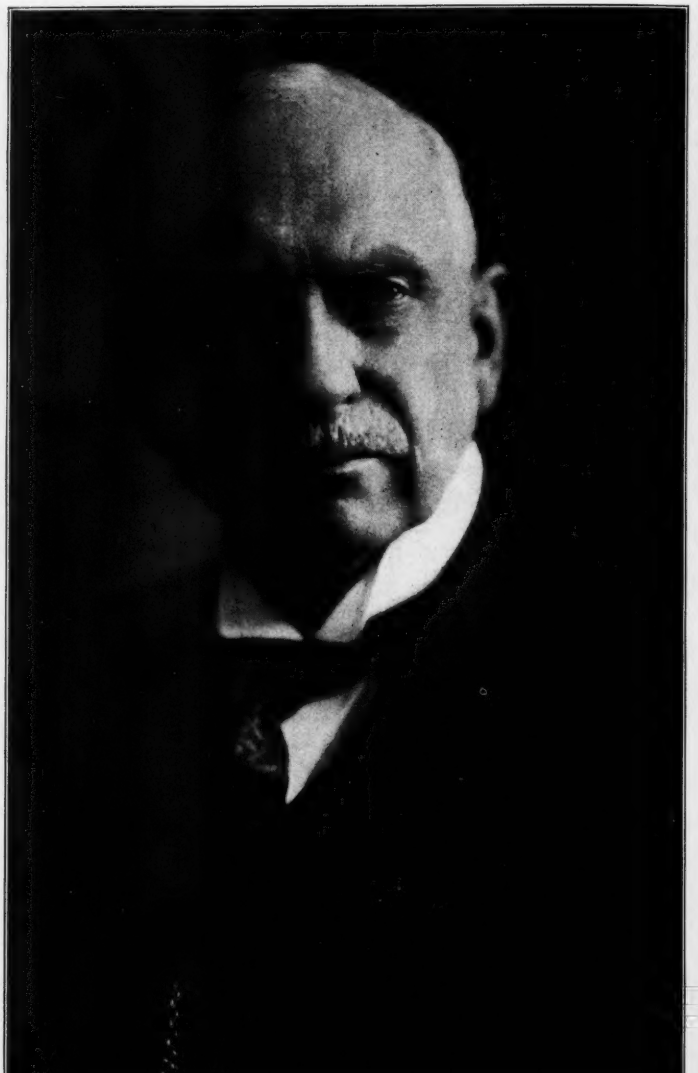

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President-Elect of the American Dental Association

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Original Communications

THE STRUCTURE AND FUNCTION OF THE ALVEOLAR PROCESS

By HUGH W. MacMILLAN, D.D.S., M.D., Cincinnati, Ohio

(Read before the Section on Stomatology at the annual session of the American Medical Association, Chicago, Illinois, June 9-13, 1924)

THE alveolar process has been defined as "simply a curved row of tooth sockets made of very light plates of bone, which are absorbed after the loss of the teeth."[1] Talbot describes it as transitory tissue composed of soft, spongy bone of cancelloid structure, which is entirely absorbed after removal of the permanent teeth; stating that if it (the tooth) should be extracted early, the process would not be developed at that point. Quoting further from Talbot: "The alveolar processes . . . should be considered as practically distinct bones—their structure, functions and embryology differ so completely from the structure and functions of the maxillary bones."[2] Hopewell-Smith says, "The free rim (of the alveolus) is so thin that there is little, if any, room to accommodate any medullary or Haversian canals. It has thus an impoverished blood supply, and its vitality is necessarily very low."[3] Quoting from Walkow, Noyes describes the cortical plates as varying in thickness, depending on the stress to be sustained. The direction and arrangement of the plates of cancellous bone are continually

1. Piersol: Human Anatomy, Philadelphia, J. B. Lippincott Co., 1907, p. 200.

2. Talbot: Interstitial Gingivitis, Philadelphia, S. S. White Dental Mfg. Co., 1899, p. 22, 27.

3. Hopewell-Smith, A: Histology of the Maxillary and Mandibular Bones, Dent. Cosmos, 1901.

Fig. 1

Fig. 2

Figs. 1 and 2.—Fig. 1, The central incisor regions, showing relation of superior central incisor to inferior lateral incisor. In Figures 1-9 note the axial relations of the superior and inferior teeth, the relative thickness of labial and lingual alveolar plates, the characteristics of the cancellous tissue, the relative densities, and the relation of the teeth to the important structures. Compare the changes in the external contour and internal architecture of adjacent sections. The sections in this series, with the exception of Figure 4, were taken from the same cadaver and are from the left side. A plaster cast was made before sectioning. The sections were reassembled in the cast and held in exact axial relations while being roentgenographed. Fig. 2, The lateral incisor regions. Note position of apex of superior lateral incisor.

changed and rebuilt to readjust them to the support of new conditions."[4]

According to Koch, the earliest mention of the mechanics of bone is accredited to Galileo (1638), who is said by Monroe (1795) to have made reference to the mechanical importance of bone. From that time on, numerous contributions have been made by several investigators. In 1892, Wolff's law was formulated. Koch, in his monumental work on the laws of bone architecture, arrives at the two following special conclusions: 1. Spongy bone and compact bone are homogeneous materials and differ chiefly in strength approximately in proportion to their densities. 2. The thickness and closeness of spacing of trabeculae in bone vary directly with the intensity of the stresses transmitted by them.[5]

Paraphrasing the foregoing conclusions: The alveolar process may be defined as that part of the jaw bones which gives support to the teeth or their artificial substitutes, and is composed of compact and cancellous tissue arranged in its external contour and internal architecture to best meet the stresses transmitted during mastication. It may be further emphasized that the relation of opposing teeth, the length of the cusps, different degrees in the axial angles of the superior and inferior teeth, the influence of the accessory factors concerned in mastication, and all the remaining causes, pathologic or otherwise, which may affect individual bones or the osseous system in general, are as indelibly imprinted on the structure of the alveolar process as environment influences the head of the femur.

4. Noyes, F. B.: A Textbook on Dental Histology and Embryology, Philadelphia, Lea and Febiger, 1921, p. 336.

5. Koch: Laws of Bone Architecture, Am. J. Anat., 21: 177-229, (March) 1917.

The limiting boundaries of the alveolar process have never been defined.

Fig. 3.—The cuspid regions. Note anterior extremity of maxillary antrum.

Its physical appearance varies from the lower border of the jaw only in the

thickness of the bone and in the greater number of nutrient foramina. The roentgen ray reveals a similar density throughout the compact bone in a cross-section. In that part of the process which is subjected to heavy stress, its resistance to the ray would hardly class it as "soft, spongy bone." Over the cuspid eminences, where the bone over the middle third is often thin and even

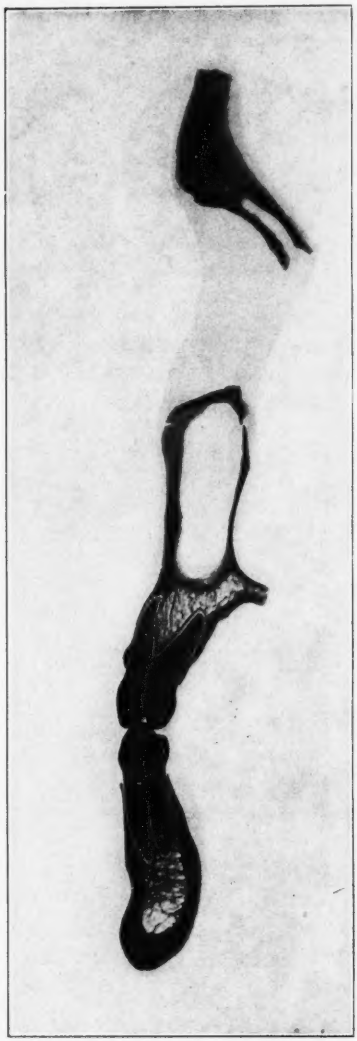


Fig. 4.—The first bicuspid regions.

Fig. 5.—The second bicuspid regions.

absent, owing to the mechanical requirements of that particular location, there

Fig. 6.—The first molar regions showing relations of (C) mesiobuccal and lingual root with (D) mesial half of lower molar, (A) distobuccal root and (B) distal half.

is no necessity for medullary spaces, as the thin bone is readily nourished by the periosteal vessels. However, the thicker bone at the gingival margin of the cuspid contains medullary spaces and is beautifully nourished and

adapted for its particular requirements. The thin free rims described by Hopewell-Smith do not take on the character of bones showing impoverished blood supply and low vitality when examined in thin cross-sections roentgenographically. Under normal conditions, the character and arrangement of the

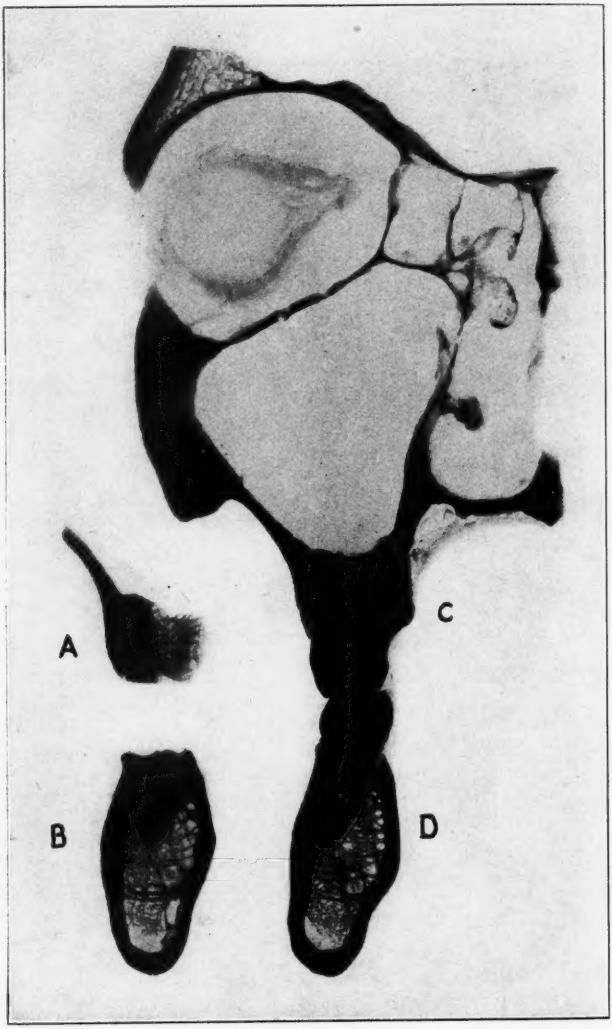


Fig. 7.—The second molar regions showing relations of (C) mesiobuccal and lingual roots with (D) mesial half, (A) distobuccal root and (B) distal root.

bone around the rim of the alveolus is a beautiful illustration of strength and economy, with perfect provision for nourishment. From its physical appearance, its function and even its development, the alveolar process needs no special nomenclature nor special pathology. It is the most beautiful illustration that

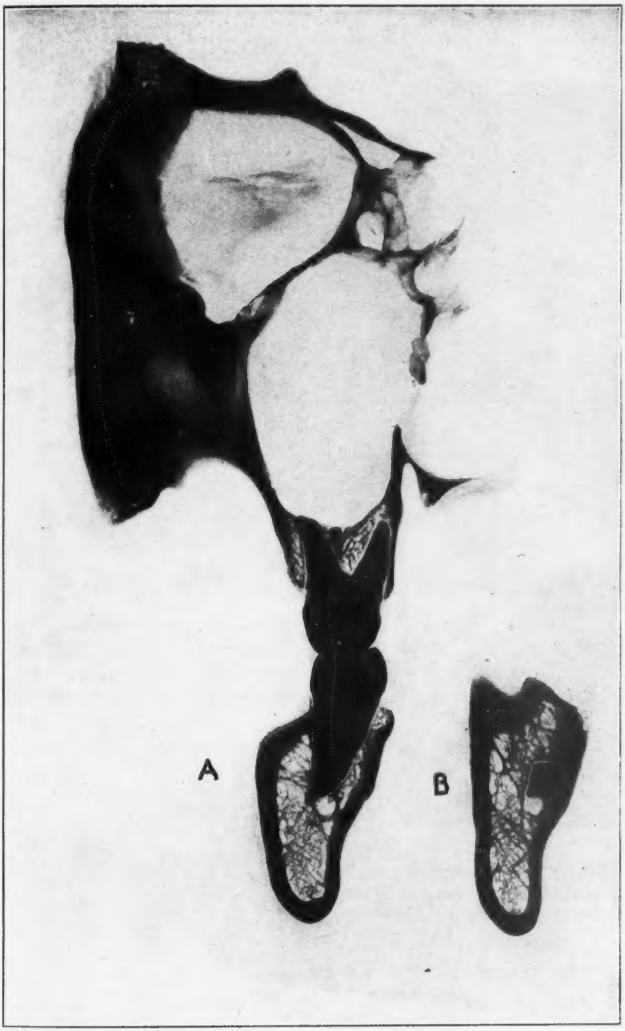


Fig. 8.—The third molar regions, (A) mesial root, (B) apex of distal root. Note deep groove for descending palatine artery.

bone is a "living plastic material which is molded by its position, stresses and environment."[6]

That there is not an appreciation of the importance of these exact osseous relations of the teeth is very evident from the artists' drawings and diagrams in most of the leading textbooks. Attempts have been made to illustrate alveolar abscesses on these misconceptions, which are as different from the true clinical findings as the diagrams are from the actual anatomy. Principles of surgical technic are also illustrated by caricatures, which automatically contradict themselves when placed alongside the real. Before attempting any surgical procedure on the teeth or the supporting structures, the normal relations should be mastered. From the examination of Figures 1-8, it will be seen that each tooth has a distinct environment that calls for individuality in diagnosis and surgical treatment.

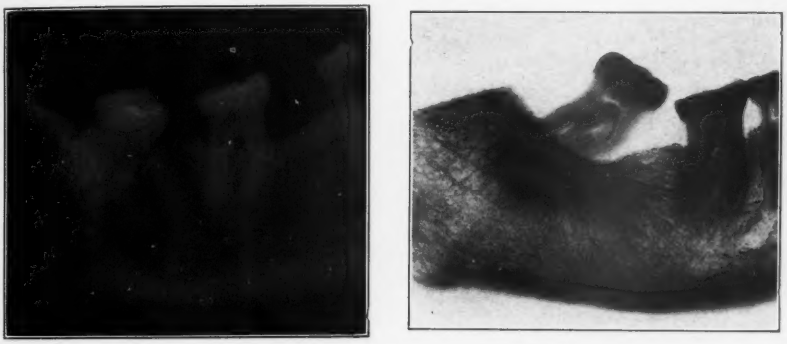
Fig. 9.—The first bicuspid regions. The upper section is 2 mm. in thickness through the area formerly occupied by the first bicuspid. Note parallel buccal and lingual walls, flat base, and formation of bone in former alveolus. Compare external contour with that of bone around the cuspid and second bicuspid.

Following the extraction of a lower first molar of a person exhibiting no disease of the alveolar border, the alveolus is filled in with bone up to the level of the alveolar border. The external contour and internal architecture of the bone is constructed in accordance with engineering principles to support the adjacent teeth and gums in the act of mastication. Following the loss of the first molar, the second molar tips forward, owing partly to the lack of support from the extracted first molar. On account of this change in the direction of stress from the superior teeth on the second molar, the cancellous tissue is rearranged. It will be seen in Figure 10A to have been absorbed and deposited in the form of supporting props similar to the props against a leaning outbuilding There is also a thickening of the cribriform plate along the mesial walls of the alveolus. If the second molar inclines to the lingual, as it usually does, the lingual plate at that point will also be thickened.

Another mandible illustrating more clearly the functional changes just described is shown in Figure 10B. Following the loss of the first molar, the second molar has tipped forward. Owing to the loss of the gingival alveolar process,

6. Function of the Periosteum in Bone Repair, editorial, J.A.M.A., 82: 1694 (May 24) 1924.

the fulcrum has been lowered, the apical region and the bone mesial to the tooth being thereby subjected to increased stress. This has resulted in an increased "closeness of spacing" of the bone around the apex and a heavier and denser foundation of the supporting props. There is also the broadening and thickening of the apices of the second molar in order to give the root a larger area for support in the bone. The external contour and internal architecture of the teeth themselves are subject to the same architectural laws.



A B

Fig. 10.—The "closeness of spacing of trabeculae" and the changes in direction of the supporting cancellous plates when "the weight and strain are for any reason transferred to another part" may be noted.

These areas of denser cancellation are often considered pathologic and are said to have been caused by traumatic occlusion although they are merely functional changes in the bone. When these areas occur around pulpless teeth exhibiting areas suggestive of infective foci, they are further condemned. Before describing them in pathologic terms, their functional origin should be investigated.

Applying McEwen's researches on the growth of bone to alveolar regeneration, every portion of the alveolar plates should be conserved in order to act as a framework for the periosteum, which is thereby held out in its normal position. If the supporting bone is removed, the periosteum will become bound down to the lingual plate. The result will be the same as if the supporting bone were destroyed by disease. Whether one accepts McEwen's researches or not, he cannot produce so perfect a base for a denture by surgery as is produced by the normal molding of the bone filling in the alveolus. The original height of the bone filling in the alveolus is determined almost entirely by the height of the buccal and lingual plates.

For that reason, in the extraction of teeth, the technic should be so modified that the alveolar plates will be left intact if possible during the extraction. When the shape of the tooth roots precludes this result, the alveolar plate should be separated from the tooth by a chisel, leaving the fractured alveolar fragment intact with its periosteum. In the removal of fractured roots, the cancellous tissue should be removed by

using an interalveolar plate technic in order to dislodge the fragment without injuring the supporting walls.

The removal of infectious material at

Fig. 11.—As a cross-section of the incisor region would appear following the mutilating operation of alveolectomy.

the apices of teeth should be done with the same care and thoroughness, with conservation for regeneration as the guide.

A most important fact to recognize in dental oral surgery is that, following the loss of the teeth, the alveolar process or the bone filling in the place formerly occupied by the alveoli has a very definite function. Definite changes may be shown by the roentgen ray owing to the stimulating effect of mastication on the cornified gums when no dentures are present or by the stress produced by prosthetic restorations. With this principle in mind, it will be seen how necessary it is for the patient to begin chewing gum, paraffin and vegetables as early as possible after the extraction of the teeth. The greatest factor in producing atrophy and resorption of the alve-

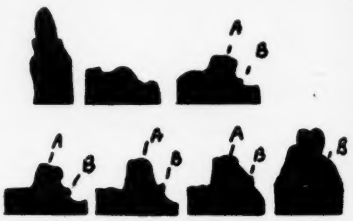


Fig. 12.—a, internal alveolar plate; b, external alveolar plate.

olar ridge is disuse. This is combated only by the impact of food or the denture on the ridge. Among the poorer classes, who, after loss of the teeth, masticate all their food on their gums, the prominence of the alveolar ridge is remarkable. Beautifully contoured ridges are also observed after years of wearing dentures when the teeth have been extracted before the bone has been entirely destroyed by pyorrhea or removed by accident or intent. In one interesting case, after the removal of the entire external alveolar plate and cancellous tissue of the right half of the lower jaw, the lingual plate developed into the perfectly contoured ridge shown in Figure 12, owing to the stimulation of a perfectly adapted prosthetic restoration. It has long been observed that the

bone is characterized by closer cancellation around the teeth supporting bridges. Increased density and closer spacing of the trabeculae of the alveolar process can also be shown under partial and full denture restorations.

Conclusions

1. The alveolar process and the teeth are subject to the same laws of bone architecture as the remaining skeleton.

2. There are no boundaries, geographic or otherwise, between the jaw bones and alveolar processes.

3. There is need for revision of textbook illustrations showing relations of the supporting structures of the teeth.

4. Following extraction, the alveolus is filled with bone, which conforms to the mechanical requirements of that particular location.

5. Functional changes are often considered pathologic.

6. Conservation for regeneration should be the guiding rule in dental oral surgery through the use of an interalveolar plate technic.

7. The alveolar process has a very definite function after the loss of the teeth and responds physiologically to the stimulation of artificial restorations.

Discussion

Frederick B. Noyes, Chicago, Ill.: Through nearly the whole of the session of yesterday, as through many other similar occasions, I was unable to avoid the feeling that the essayists were being led into more or less grave mistakes because of insufficient study of the normal tissues. Dr. MacMillan has beautifully brought out in his paper the fact that bone is regenerated to fill the alveolus where a tooth is extracted. It seems to me that it should in itself be a sufficient argument to confute the practice of removal of teeth by the removal of the entire labial plate of the process. The result can be nothing but an unnecessary mutilation which will result in trouble to that patient through life.

I would like to enlarge on the fundamental early parts of Dr. MacMillan's paper, with reference to the characteristics of bone as a tissue. In the evolution of the mammal, the bone has been developed for the purpose of sustaining mechanical stress, and I have emphasized again and again that bone is always formed and reformed in response to mechanical stress which it receives. Every bone functions as an organ of support, and the minute detail of the structure is determined by the character and the amount and the direction of the stress that it receives. This is certainly just as true of the bone that supports an artificial denture as it is of the bone that supports the natural organs, and the importance of considering the conditions that will result with reference to the support of the artificial substitute should never be lost from the mind of the surgeon who removes the natural organ.

Dr. MacMillan's illustrations show beautifully the detail arrangement of the trabeculae that form the cancellous portion of the bone, and I want to repeat that every one of those little plates of bone is laid, not by chance, but by response to the stress that the organ receives; and the most striking characteristic of bone through its whole period of function is its ability to readjust and rearrange the details of its structure in response to changes in the mechanical stresses to which it is subjected. The contrast between the fancy of the artist and the work of nature, shown in the illustrations, is most eloquent as regards interpretation of pathologic conditions and future physiologic conditions. It calls for a new and a large volume of work, because Dr. MacMillan realizes that true typical illustrations can be made only after preparation of a very large number of individual instances from life or from nature, rather; for they are not from life.

I have for a number of years called the attention of orthodontists to the importance of the preparation of series of sections such as Dr. MacMillan has made, through the roots of the teeth, for the purpose of studying the support of the teeth against the natural stresses. I want to recall one generalization which we made by Professor Osborne, I believe, in a long essay on the mechanical influences in the development of the mammalian skeleton, and it is important because it clearly states a fundamental characteristic that is well illustrated in Dr. MacMillan's illustrations. I am not stating this exactly but in principle: Bone develops in the direction of the forces to which it is subjected, and, in that development, the growth of bone in the direc-

tion of the force is thin in amount and dense in structure, and away from the force, it is comparatively thick in amount and light in structure. So in these incisor teeth that Dr. MacMillan has shown in the development of the denture, the forces and the direction of movement have been downward and outward; that is the direction of the force, and on the labial side of those roots the bone is thin in amount and dense in structure. The teeth under the force have been moving away from the palate, and, on the palatal side, the bone is thick in amount and cancellous or light in structure; and the detail of arrangement is always such as to sustain the tooth against the forces which it receives.

Dr. MacMillan beautifully illustrates the fact that the thickening of the bone in the gingival third of the alveolar process is in response to the force in that direction, and when the cusps are long and the force is great, the thickening in that portion will be greater in amount. In the middle and apical third, there is little impression on the bone in the thrust in that direction, and the root will often be entirely uncovered. In the apical region, where again you receive a tilting strain in both directions, there is always an increasing amount of bone in the area. You may go further and make the general statement that the total amount of bone and the character of bone will be a direct index to the amount of force that is used or exerted on the occlusal surfaces of the teeth in function.

As has been said we can be guided in our study of pathologic conditions only by a previous study of the normal.

Edward H. Hatton, Chicago, Ill.: The great importance of presenting this work is in the evaluation of the type of surgical extraction of teeth as mentioned by Dr. MacMillan and of the theories of origin of certain diseases, such as pyorrhea. Dr. MacMillan has presented anatomy, not pathology. There are changes in bone in which the effect of stress is overcome by other factors of a pathologic nature, yet the interpretation of pathologic conditions can be made only on the basis of an anatomic foundation.

Bone changes conform to Roux' law of functional adaptation.

I wish that some of the illustrations instead of being through the center of the teeth had been toward either side so as to show the relationship in the interproximal spaces.

Dr. MacMillan, (closing): It has been a source of great gratification to me to hear the discussion. I should like to express my appreciation for having had the opportunity to talk to Dr. Hatton sometime ago about this problem, and especially to tell about the help I have had from Dr. Noyes' "Dental Histology and Embryology," which is the only reference to the subject I have been able to find in dental textbooks. The sections between the teeth referred to have also been photographed by the roentgen ray and studied. They will furnish an opportunity for continuing the discussion at some future time.

SOME PSYCHOLOGIC PHASES OF FULL DENTURE PROSTHESIS

By DAYTON DUNBAR CAMPBELL, D.D.S., Kansas City, Missouri

(Read before the Chicago Dental Society, November 20, 1923)

THE actual construction of an artificial denture may be left wholly to the laboratory mechanic. (This is especially true of the technic that I follow, according to which the anterior teeth are selected and arranged at the time of securing central occlusion.) If an intelligent and skilful mechanic is provided with the pattern and definite instructions, he can supply a satisfactorily constructed denture, as well as the jeweler's assistant can finish at his bench a beautifully designed emblem. He may proceed as definitely as the civil engineer who follows the blueprint and builds abutments and spans rivers.

However, when the emblem or crest is finished, the jeweler's work of construction is done; when the engineer has swung his bridge across the space, he moves on. The prosthetist, when his mechanical work has been completed, still is confronted by conditions which may set at nought matchless workmanship and render useless the highest product of his skill. To compare his problems with those of the others, we should think of the engineer endeavoring to rest his abutments upon foundations which change their character with the setting of the sun, or think of the creation of synthetic pearls, whose delightful luster depends in part on the health of the wearer.

The prosthetist's success depends on the success of his patients in wearing the dentures that have been constructed. The division of the spoils of victory might be suggested as 50 per cent to the one who constructs the dentures and 50 per cent to the patient who wears them. Actually, the prosthetist may be entitled to an additional share; let us say he may be entitled to one half of the patient's half of the success, because the prosthetist's skill was required in order to secure from the patient the maximum results. "How to secure such cooperation from the patient that the prosthetist's skill may yield maximum results" might well be the title of this paper.

While it is true that the problem of denture construction is a problem of mechanics, and that the problem of denture retention is fundamentally a problem of physics, the problem of the patient's adaptation to the denture is largely a problem of mental processes. The science that deals with these mental processes is psychology, and my present interest is limited to its application in the realm of denture prosthesis; to be more specific, I am interested in the art of employing a knowledge of the mental processes—the likes and dislikes, the biases and prejudices, the ambitions and aspirations, the fears and confidences, the clear rational thinking and the unreasoned habits and attitudes of individuals who seek my services in securing for themselves satisfactory artificial dentures.

Psychologic Value of the Patient's Confidence in the Prosthetist's Ability and Methods of Securing the Kind of Confidence Desired.

The patient's confidence that the prosthetist is fully qualified to supply satisfactory dentures is indispensable if thorough cooperation is to be given. At the same time, this confidence may be found to be an undesirable trait and may

easily result in the undoing of the prosthetist. Especially is this true, if it is not accompanied by or permeated with an intelligent appreciation of the results that properly may be expected. While in most professions and lines of vocation, it may be said, almost without exception, that a satisfied patron is the best recommendation, this statement needs to be qualified, when the denture prosthetist is concerned. Between overconfidence and the patient's lack of confidence, I should choose the latter.

An ambitious, strong-willed young woman who has never worn dentures places herself in the prosthetist's care, and has her teeth removed and her mouth prepared as directed. She is easily supplied with dentures covering a large area; by diligent endeavor she masters the mysteries of mastication as well as the clicks of conversation. An older woman, less vigorous in health, with superfluous face tissue, wearing her fourth set with peculiar lip control and exaggerated movement of the mandible, wants a similar set. The operator recalls the case, stating that the younger woman had an excellent mouth for dentures, and was ready and untiring in her efforts to become accustomed to them. With these or similar words, he succeeds in impressing this patient with the idea that she, herself, will be an important factor in securing dentures which she may wear with such satisfaction as her friend enjoys. This type of patient has all the confidence necessary; the prosthetist is safe in destroying a portion of it, while at the same time stressing the patient's responsibility for the success of the case.

Usually the specialist has an advantage as compared with the general practitioner in that the patient goes to the prosthetist with the confident expectation of securing superior results. Of course, in order to secure the continuance of this initial confidence the specialist must be qualified to render superior service, which, in many instances, consists largely in encouraging the continuance of the confidence which brought the patient to this office instead of to another. However, its continuance must not be encouraged in any way that may tend at any stage to relieve the patient of his full share of responsibility.

Integrity Only Guarantee of Satisfaction

When I was just beginning to specialize in full dentures, I sought to encourage confidence in my ability to render satisfaction through the use of an appointment card, on the reverse side of which was printed a list of fees, with this sentence beneath: "It is distinctly understood and agreed that should the dentures prove unsatisfactory sixty days after their completion, four-fifths of all money paid shall be returned upon receipt of the dentures." The use of this type of encouragement was discontinued because I decided that its use encouraged the patient to expect satisfactory dentures *or* the return of the fee; there should be no alternative in the mind of the patient—he should be expecting satisfactory dentures. I now say nothing about the return of the fee. I insist that the patient must be satisfied; other patients have been satisfied, and it is such satisfaction which has built my practice. Until the dentures are satisfactory, the prosthetist's services are not completed, and he will welcome opportunity at any time to render them as satisfactory as the patient expects them to be. When sufficient time has elapsed to enable the patient to profit fully by the prothetist's services—psychology included—and the prosthetist finds that his efforts and the patient's cooperation are not sufficient to produce satisfaction, the whole amount of the fee should be returned. Its return will undoubtedly surprise the patient, and he will not unlikely prefer the dentures to the refund, especially if he has been impressed with the prosthetist's integrity and has concluded that the degree of satisfaction already attained is preferable to a prolonged series of visits

elsewhere. The refund is made cheerfully. The patient's confidence in the principles according to which the prosthetist conducts his practice and the good-will which is inevitable will prompt high recommendation among friends, when skill, courteous treatment and satisfactory results are being discussed. I am not now concerned with the question as to the justice involved in returning or retaining the fee: I am merely calling attention to the fact that men's minds—women's too—are thus influenced in such a way that the practice of returning the fee to dissatisfied denture patients is very effective in increasing a desirable clientele.

The patient's confidence in the prosthetist's ability to give satisfaction in the wearing of dentures is increased, if the prosthetist has sufficient confidence in his own mastery of the situation to assure the patient that this is the last fee that will ever have to be paid for dentures. Of course, loss of dentures, or their destruction or injury through accident, are not covered in this assurance. I am, in most instances, prepared to offer assurance that, in the case of metal bases adapted to tissues which have apparently ceased to resorb, there will be no other fee, because there will be no need of reconstruction—a "permanent" one, if you will permit the term. In the case of "temporary" dentures—those which mouth conditions at the time of construction of dentures indicate will, in all probability, need to be replaced or reconstructed—the patient understands that a further fee must be paid for services rendered on account of change in tissues.

Psychologic Value of Patient's Confidence in His Own Ability

Previously, in this paper, attention has been called to the fact that the patient's confidence in the prosthetist's ability is indispensable to the best results. The patient's confidence in himself is even more valuable. It is important to believe that the prosthetist will construct the best possible dentures; it is more important to believe in one's ability to wear the dentures. These two types of confidence are reciprocal in their effect, especially when the patient's confidence in himself precedes stimulation of his confidence in the prosthetist.

The insertion of temporary bases, within thirty minutes or an hour after the teeth have been removed, contributes in a remarkable degree to the patient's confidence in his ability to wear dentures with satisfaction. Besides serving to give proper form to the blood-clot, and as a rest for the mandible, the satisfaction that the patient finds with these in his mouth compared to that with nothing to serve as rests or to hold out his cheeks and lips imparts a readiness to tolerate foreign objects of this size in his mouth. Their tendency is to render him amenable to the further demands that dentures intended for masticatory purposes will make on him. I have yet to find an instance in my practice in which a patient thus provided with temporary bases has not worn dentures with readiness and comfort.

Payment of the fee in full before the dentures are worn out of the office should be regularly required. From a financial standpoint, there is nothing lost, and, from the psychologic point of view there is everything to gain by this practice. It is probably the best possible method of encouraging the patient to lend the necessary cooperation to make the dentures satisfactory. Patients will wear their own dentures and make vigorous efforts to become accustomed to them, when they would have little interest in those belonging to someone else. If the fee has not been paid, the dentures belong to the prothetist. While the patient does not often actually reason out the situation in this manner, he is unconsciously, or subconsciously, influenced unfavorably.

The psychologic value of payment in full is so great that your essayist refuses to deviate from it, regardless of the

financial rating of his patients, and regardless of the fact that in dealing with all others, they regularly send a check on the first of the month. If there is reason to believe that a patient may resent this method, because it may seem to be a reflection on his integrity, the subject may be approached firmly and then followed up closely with: "It is a rule that I have always followed and I am sure that you would not wish me to make an exception in your case." And then, without waiting for a reply, the operator may turn to another phase of the case with some remark, such as, "Did any of your natural teeth overlap?"

If the patient neglects to raise the question as to when payment of the fee must be made, the prosthetist should very frankly mention it, saying perhaps: "Now, wouldn't you like to know what these restorations are to cost, and the terms on which they are supplied?" The answer is always in the affirmative. Explanation is given and emphasis laid upon the requirement that half of the fee is to be paid when the impressions are taken and the remainder, when the dentures are inserted. Please bear in mind, that "inserted" does not mean "completed," for the dentures may not be completed, so far as minor adjustments are concerned, for six weeks or, in some instances, three months. If the patient has come ready to have the impressions taken, and is not prepared to pay half of the fee at that time, the suggestion may be complied with at the next appointment. It is really an unimportant detail as to whether the fee is paid in two installments or whether the whole fee is paid when the dentures are inserted. The vital matter is that the dentures should belong to the patient when he begins to wear them. It may be observed, too, that insistence on a rule of this kind strengthens the dentist's ability to secure the psychologic aid in every case, which otherwise in many instances he may never secure. Also, a rule requiring two payments does not seem so exacting as a rule which insists on the fee in one lump sum.

The patient's confidence in his ability to wear new dentures is encouraged, if the old dentures are kept by the operator. The new dentures must then, perforce, be worn, and the more quickly will the tissues become adapted to them. "I usually keep the old dentures, and I shall take it as a favor, if I may retain yours." If this is not successful, the dentist may secure permission to retain them for a week or several days. When the patient positively refuses to leave them, I usually obtain a promise that the old dentures will not be worn without first securing consent. Assurance is given that if consent is requested, it will be given; and thus far I have never been asked to grant permission, and have never learned of an instance in which the promise was violated.

Some helpful, practical suggestions often enable the patient to obtain relief from annoyances due to improper use of the dentures. Before the dentures were constructed, the wise operator acquainted the patient with the fact that, for most people, artificial dentures are not superior to natural teeth. While artificial dentures have their limitations, these may be reduced by a knowledge of the proper use of dentures. For example, a patient who has worn dentures finds that his new dentures are not so close together as the old ones; consequently, when he brings them together during masticating movements he is often annoyed by the clicking sound that is made. He may be inclined to tolerate this, unless the operator advises him that this is wholly unnecessary and that he may learn to close them without any more noise than he experienced with the old ones. Again, a patient who is otherwise perfectly satisfied with his dentures is much provoked and embarrassed to find them easily displaced when he blows the sawdust away from his patterns. He may be taught a method of blowing that will not interfere in the least with reten-

tion of his dentures. The technic of eating an apple or corn on the cob is different from that which characterized the use of one's natural teeth, but it may take the patient a long time to find out for himself that instead of biting and pulling the apple away from the teeth, he will get better results by pressing against the teeth with the mouth partly open, then closing on the apple until a portion is cut off, after which the rest of the apple may be withdrawn.

When a patient has gained the impression that the denture is too long, he should understand that a few days longer of wearing it may disclose the fact that the difficulty is wholly one of becoming accustomed to it. Of course, it is not necessary to tell him this in so many words. The prosthetist may suggest that the length assists in retention and that it may be shortened as much as necessary if it continues to seem too long. If the patient insists that he cannot tolerate the nausea resulting, the operator may often cure this "mental nausea" by inserting his finger into the patient's mouth and rubbing firmly but quickly the portion of the vault at the end of the palatal portion of the denture, and then withdrawing the finger immediately, with the remark: "You don't suffer from a denture that is too long; the trouble is that your denture is not long enough and does not press firmly enough against the vault of your mouth;" provided this is the fact. If, on subsequent visits, the patient continues to insist that the denture is too long, I very willingly consent to shorten it. In most instances, a few vigorous motions, with a cuttle-fish disk across the palatal border, as the patient witnesses the shortening, is sufficient to convince him that enough has been removed to afford relief.

When a patient has but little patience and returns to the office with or without the slightest provocation, a period of meditation in the reception room before the prosthetist dismisses his patient who is now in the chair often develops patience, or at least toleration for a longer period than had been anticipated. A somewhat longer period of meditation may be prescribed for other unnecessary visits, unnecessary physiologically but highly desirable, psychologically considered. Appointments designed by the prosthetist to spoil a beauty-nap or make it impossible to attend the matinee also help the patient to tolerate seemingly intolerable conditions.

Other patients, instead of imitating pampered children, resemble Spartans. They suffer severely and may be tortured by some irritating portion of the base, rather than "bother" the prosthetist. Sometimes, it is necessary to call these patients and insist that they are not treating the dentist fairly when they do not give opportunity for adjustments that he knows usually must be made.

Value of a Friend or Relative's Assistance

If dentures are properly constructed, the patient will be inspired by a knowledge of this fact to assume more readily the responsibility for successfully wearing them than if he has doubts as to their construction. When someone doubts the appropriateness of the hue or the size or form of the teeth, or questions their arrangement, the patient will be strengthened in his conviction that the doubter's esthetic appreciation is poorly developed, if a friend or relative has previously said that the selection and arrangement are correct. This friend or relative should be present when the teeth are selected and set up in the occlusion models.

As a student of art, or as gifted with superior esthetic appreciation such as would enable him to be a genuine consultant, the friend's judgment may possibly be rated low, and the prosthetist may have the double task of convincing patient and friend as to hue and mold best suited for the case, but psychologically, the assistance rendered may be estimated as immeasurably high.

The operator will be in position to

confirm the appropriateness of the final result, if he is able to compare it with photographs of the patient's face and records as to the arrangement, hue, size and form of the natural teeth. The teeth themselves set up as they appeared before removal constitute the best record. Both patient and friend may be helped to see the wisdom of a selection appropriate to the case, if the operator will select, for example, the whitest tooth of the hue guide. Holding this tooth in position in the mouth, he may observe, and both of the others will usually be quick to agree, "This is much too light." Similarly, with the darkest one in position: "This is too dark." Then, selecting the tooth which he has seen is best suited for the case, he may hold it in position and find that both agree with his selection. Endorsement may be more easily secured, if it is possible to keep the rest of the hue guide from being brought into view.

The real assistance, however great this may be when the teeth are being selected and arranged, will be rendered while the patient is wearing the dentures. Consciousness of the correctness of arrangement and appropriateness will be fortified by a knowledge that these were assured by a prosthetist of ability, by a friend whose judgment is equal to that of any other friend's and by such endorsement as the patient himself gave.

Psychology in Its Relation to Prosthetic Wellbeing

An increasing sense of wellbeing is characteristic of our generation. Americans are proud of the fact that their standards of living and ideas of comfort are considerably higher than those of the Oriental. Nearly everyone seeks something more than the bare necessities of life; some covet an education and avail themselves of a broad culture, without expecting these to contribute aught else but a deeper enjoyment of life.

Artificial dentures are not indispensable. Not infrequently octogenarians have "gummed it" during the last quarter of their existence and have not expressed dissatisfaction with life because of this lack. But most individuals today are unwilling to forego some kind of teeth; and in seeking substitutes for their natural ones, they are usually dependent on the dentist for an appreciation of dentures that conform to standards to which they are accustomed in other phases of life. A patient who comes to the specialist not only expects superior results, but also usually must look to the specialist for an understanding as to what constitutes superior results. To acquaint patients with the possibilities of artificial dentures that they are justified in expecting, and then to fulfil their expectations, is the task of a prosthetic psychologist. In other words, in giving a patient a sense of prosthetic wellbeing, the task of the prosthetist is largely one of applied psychology.

I have found that this sense of wellbeing is helpfully communicated in the course of acquainting patients with the merits of platinum base porcelain gum dentures. It serves to give them an ideal. If they cannot well afford these, and if esthetic requirements do not demand their construction, patients nevertheless find themselves more readily convinced that they are fully able to have gold or aluminum base dentures. Whenever at all possible, I supply my patients with mental base dentures. I am so thoroughly convinced of their superior merits that I would regard myself as guilty of a species of malpractice if I did not endeavor to supply my patients with these. In addition to giving to the patient and his friends and relatives an appreciation of the possibilities of prosthetic art, the presentation of the continuous gum denture is the occasion of such remarks by the patient and those with him that the prothetist may gather data that will indicate to what extent this patient may become a patron of such art. Metal bases, besides contributing to a sense of wellbeing through giving the patient a satisfaction in possessing

dentures of this type, and through enhancing his enjoyment of viands whose palatability to a large extent depends on the temperature at which they are served, are superior to vulcanite in cleanliness and in freedom from injurious effects on the tissues. However, the patient is perhaps most strongly influenced by the fact that metal is a good conductor of heat and cold and that a person wearing metal base dentures may more thoroughly enjoy such viands as tea, coffee, and ice cream.

When the patient has it brought to his attention in a tactful manner that dentures serve for years and that the fee paid for them if distributed as a cost item of so much a year is small compared with yearly expense for wearing apparel or other personal comforts, there is little difficulty in enabling him to see that he can easily afford gold or aluminum base dentures. If the esthetic requirements demand, the patient usually can afford the continuous gum dentures. Just why so many dentists fail to supply patients who well afford the best with anything but poorer quality in dentures is difficult of explanation, except on the assumption that the dentists themselves are not sufficiently acquainted with the surpassing merits of dentures of the highest type to believe in them, and consequently do not experience a regret when it is necessary for any reason to supply anything of less merit.

Of course, there are members of the dental profession, just as there are members of other professions, who experience regret only when it is associated with pecuniary loss or the possibility of a reward that might have been greater in dollars and cents. Individuals of this type see nothing of beauty in a sunset at sea, experience no thrill in the presence of a heroic deed, and are left unmoved by the masterpieces of the great composers, painters and sculptors of the world. For them, dentistry is drudgery, its ideals are vagaries, and bread and butter are the only perquisites of life.

To the artist prosthetist, who rises to the level where he may live in the same realm with those whom he serves, Ruskin's sentiment makes a strong appeal:

> All works of quality must bear a price in proportion to the skill, time, expense and risk attending their invention and manufacture.
>
> Those things called dear are, when justly estimated, the cheapest. They are attended with much less profit to the artist than those things which everybody calls cheap. Beautiful forms and compositions are not made by chance, nor can they ever, in any material, be made at small expense.

There need be no hesitancy in telling patients that the materials for dentures cost no more than the portrait painter pays for a few feet of canvas and some brushes and tubes of paint. It is hardly necessary to suggest to them that both painter and prosthetist mix their paints and their porcelains with the most expensive media known to men; patient and patron have always been found who are ready to pay for skill.

What is it worth to possess efficient, masticatory substitutes, which may be worn with such comfort that the wearer forgets that they are not physiologically a part of himself; dentures that, often enough, have been demonstrated before state and national societies as constructed with such skill that they absolutely defy detection as artificial, even within the closest conversational range? Who will say that the restoration of facial beauty, together with the restoration of gratifying masticatory efficiency, the relieving of embarrassment and increasing of self-confidence is not deserving of even greater regard than the artist's achievement of a portrait, whose charm may lack nothing but the breath of life?

Problem of Securing Central Occlusion

Psychologically considered, the problem of securing central occlusion is the problem of leaving the patient's habitual movements undisturbed.

The prosthetist seeks, in securing central occlusion, nothing more than a record of the central occlusion relationship of the patient's jaws, a relationship

which the patient establishes a thousand times a day when he may be miles from a dental chair. The photographer, who takes sittings of children in their own homes, gets some splendid life-like results. If the prosthetist could evolve with the patient at home a method of registering central occlusion in the use of his jaws, while eating a meal, perhaps, he would more easily achieve the result which he seeks. Just as the expression on a child's face shows that it is difficult for him to be natural in the midst of the strange surroundings of a photographer's studio, so do the efforts to secure central occlusion show how difficult it is for a patient to be natural in masticatory movements, in the midst of the usual directions and paraphernalia employed. Psychologically, photographer and prosthetist have the same problem; each employs his own peculiar methods in solving it. Neither is able to get the results he seeks simply by requesting the patron or patient to give it. The old-fashioned studio exhortation, "Now, look pleasant, please," yielded some curious specimens for our mother's album. "Close naturally, please," or "We are now going to get your natural bite," are types of appeal which are even more futile in the prosthetist's attempt to get the desired reaction. The photographer with his antiquated method will be more likely to get a desirable response than the prosthetist who employs the expression just mentioned. Nearly everybody has an idea as to how he looks when he is looking pleasant, but how many have the slightest intimation of a "natural bite"!

As a rule, the more completely a person's attention is diverted from his method of executing a habitual movement, the more nearly will a normal or natural movement result. A habitual movement is one that ordinarily does not require the attention of consciousness in order to secure its performance. The closing movement desired in securing central occlusion is but one of the series of movements necessary to mastication, which is purely a habit. Similarly to other habits, it is difficult to select a single act of the series and concentrate on the method of performing it; in fact, the effort to separate an act from the series in the midst of which it usually occurs is often not only confusing but utterly unavailing. This is true of some of the most simple habits; for example, in dressing, do you don your coat by first inserting the right arm and then the left, or vice versa? In jumping, do you "take off" with your right foot or your left? In starting your follow-through stroke, are your elbows above the plane of your hips or below? In alighting from a moving train on the left side, does your left or right foot first touch the pavement? Is the same answer true when you alight from the right side? How much greater confusion of mind, to say nothing of embarrassment in execution, is aroused by the request to "close naturally"! And the confusion and embarrassment will not be lessened by the patient's knowledge that successful dentures depend on doing the act requested correctly.

Instead of asking a singer to sing a particular note of melody, we will do better to ask that the melody be sung, so that we may give our attention to this one note; rather than ask the instrumentalist which finger he uses in beginning the cadenza or starting the difficult arpeggio, let us ask that the selection be played, and while it is being played, we may watch the fingering for ourselves. In both instances, we shall obtain a more satisfactory reply than if we insisted on the singer's or player's unnatural, or nonhabitual concentration on a unit of series. Likewise, if the prosthetist can take his central occlusion from a series of closing movements made by the patient, he will secure a habitual relationship of upper and lower jaws which, incorporated in the artificial dentures, will be found to be correct.

Accordingly, during the process of re-

cording central occlusion, no mention of "bite" should be made, because this word will convey to the patient a suggestion in keeping with his past reactions on meeting with this word. "Bite" instinctively prompts a protrusion of the lower jaw, as in the act of biting an apple, just as "gnaw" prompts him to get ready to use his cuspids, as "nibble" suggests a mincing use of the centrals and laterals, or as "chew" suggests an excursion of food over the molars.

Suppose the bases in position for the closing movement. Let the operator casually remark, "I wonder whether you can close your mouth with your new wax teeth." And as the remark is finished, the operator closes his jaws with a snap into correct central occlusion. The patient, following the suggestion, tries, but instead of bringing them together as the dentist desires, thrusts his jaw forward to one side. Let the dentist say, "Fine. Now see if you can do that again." This time the jaw lunges to the other side. "Good, you don't have any difficulty at all," and with a few other remarks of encouragement, the dentist continues to invite the closing movements until the patient brings the bases into correct apposition.

In fact, from the psychologist's viewpoint, every movement made by the patient is correct, in that the chief object is to secure a series of movements in the midst of which may be obtained the one that the prosthetist desires to record. Nothing should be said or done that will lead the patient to think that any movement of the jaw is not exactly as the operator wishes it. Every movement is correct; every relationship of the jaws is correct. I mean by this that there should not be aroused in the patient an anxiety about closing just right, since such concentration may defeat its accomplishment. If the patient were not making an unhabitual effort to perform the correct or habitual closing movement, he would respond almost instinctively with the correct movement, immediately on getting a sensation from the touching of the posterior portions of the two occlusion rims.

I recall instances in which excellent operators have encouraged patients to swallow and to bow the head backward; have applied pressure to the patient's chin, and have shown by retrusive movements of their own jaws the kind of movement desired. All of these methods seem to me to be contraindicated. Exhibition on the part of the operator of impatience, peevishness, disgust or disapproval, because of the patient's failure to close correctly, delays the result, and is *prima facie* evidence that the dentist does not realize that to secure central occlusion involves something more than a physical or physiologic procedure.

While emphasis has been laid on the fact that the problem of securing central occlusion is largely psychologic, it is influenced very largely by material factors which are almost wholly within the prosthetist's control. Consequently, the psychologic problem is in large measure solved, when the prosthetist has made careful preparations in anticipation of the final movement of the procedure. Quite obviously, the material factors that will be most vital in this procedure are the occlusal rims. These should be constructed with much care, and the finish and polish should be comparable, so far as the material permits, to that of the finished dentures.

The patient's mind will be free from anxiety that may be aroused through the tendency of the bases to be displaced, if the operator will take the precaution to sprinkle them lightly with powdered gum tragacanth or a similar preparation. Not only will this contribute to success at this stage, but the patient will not fear that in all probability the finished dentures will have a tendency to be displaced. Nothing occurs to suggest it.

Psychologic Improprieties in Impression Taking

Just as I seek to avoid displacement of the occlusion rims during the process of securing central occlusion, because I

do not wish to arouse any unwarranted fears, I endeavor to avoid the encouragement of all thought or movement that may militate against retention of the dentures. While it is readily admitted that the operator who is an expert in the use of modeling compound may take impressions as perfect as those taken by the plaster enthusiast, in most instances the worker with compound is guilty of teaching the patient some movements that are decidedly detrimental, in a psychologic way, to ultimate success in retaining the denture. The patient should be encouraged in every legitimate way possible to endeavor to retain the denture; instead, operators have in times past taught the patient to endeavor by seven different muscular displacing activities, namely, by whistling, sneezing, coughing, hacking, yawning, spitting and grinning, to displace the impression. The patient is thus taught, whether the operator so intends or not, that the finished denture will withstand similar efforts and be retained in spite of them. In the first place, the patient is led to believe that the impression is an unusually good one; while the fact is that any impression, if it produces a vacuum chamber, will be retained just as effectively. In a very poor impression, it may happen that, when the compound is pressed to position, an abnormally large vacuum chamber may be produced. If it be assumed that such an impression is perfectly reproduced in the finished denture, and that the vacuum produced by the impression may be produced by the finished denture, the tissues will change under the pulling effect of the vacuum. After this, the denture may be easily displaced without any review of the lessons in displacement that the dentist taught while the impressions were being taken.

Not infrequently, the dentist is deceived into thinking that his impression is a splendid one; but no impression is perfect enough to justify the contest that he unwittingly enters. He challenges the patient to dislodge it. The patient does not know that the contest has ended with the impression taking. He continues his efforts with the denture and at the end of a few days emerges victorious, and returns to the office with an "I-told-you-so" expression on his face, and perhaps later returns too frequently with the dentures in his hands.

I have found it wise in dealing with patients who have previously worn dentures without satisfaction to remark, when the impressions tend to be displaced with difficulty, "Wouldn't it be gratifying if I could assure you that your dentures will stick like that? They won't, because they will be made of different material and the abnormal condition, which now prevails, will not always exist."

Prosthetic Psychologists the Products of Prosthetic Practice

The study of textbooks in psychology and the reading of treatises on mental processes and the workings of the human mind will contribute much to the prosthetist's ability to secure cooperation from those whom he serves. He will learn to classify individuals according to certain well-defined traits of character; he may learn that certain classes or types, because of these traits, may be approached in certain definite ways; but, as a practitioner, he will learn that no individual belongs to any one of these classes or types exclusively; that each individual constitutes a class of his own. On this account, the application of the prosthetist's knowledge of mental processes in general to the particular problem of an individual will be a test of skill, and may properly take rank as an art. This cannot be learned from any other source so well as from experience. The inspiration to its mastery will come with a sincere effort of the prosthetist to fulfil his obligation as a vital member of society through continually rendering the best service of which he is capable, welcoming every patient as an opportunity to do unto

others as he would that they should do unto him.

While I cannot too strongly emphasize the contribution to successful prosthetic practice that the proper use of psychology may make, neither can I emphasize sufficiently the fact that no psychologic aid is legitimate in an endeavor to excuse an operator from any responsibility in constructing or reconstructing a denture so that it may approach as nearly as possible 100 per cent as measured by the operator's ability.

Discussion

R. O. Schlosser: Dr. Campbell told us that psychology may be legitimately applied in the practice of denture prosthesis, but he stressed the point that we should apply it logically and with reason. When he states that the technical work of denture construction can as readily be delegated to an assistant as the delicate work that a competent jeweler would delegate to his assistant provided the assistant is furnished with proper designs, I am in hearty accord with him; but not many dentists seem to be possessed with such ability, if we are to judge by the type of impressions and models they submit to the laboratory men, and these are part of the design and must furnish guidance for the man who is to do the work. When poor preparations are furnished, no amount of psychology will make the improperly constructed dentures acceptable to the patient.

I couple mouth anatomy and physiology with physics and psychology when planning the construction of dentures. Many operators forget all about the physical properties of the materials they work with and begrudge the time necessary for their proper manipulation. Then when, as might be expected, things go wrong, they become disgusted and jump from the use of one kind of material to another kind, blindly hoping that the fault is with the material they use when by right they themselves are to blame. So we find some men using plaster of Paris and others modeling compound in their impression work, oftentimes exhibiting a marked prejudice for the material that they do not understand how to use. To my students, I say that plaster of Paris has lost none of its virtues, but that they must familiarize themselves with its physical characteristics and know how to manipulate it, that neither with it or any other material can they expect anything but failures if they depend on the materials or any instrument to do the work that their brains should perform.

Dr. Campbell mentioned some of the principles of psychology that should ordinarily be applied. If we are going to make a study of the patient's mental attitude, we should in all fairness also give thought to the mental attitude of the operator. The first essential is that he be in good physical condition, as his mental attitude is greatly dependent thereon, and he would hardly be competent to judge fairly the patient's attitude if there were kinks in his own. In speaking of the use of psychology, I have constantly maintained that its rational application will always be beneficial in any work we set out to do, but it will never replace the application of the principles of physics and esthetics, or art sense, in denture construction.

The economical aspect has also been touched on. I know full well how necessary it is to have a thorough understanding of the financial problems involved in the conduct of a professional practice, yet I believe that economics should always be separately discussed.

Getting back to technic: in the matter of procuring the right bite, depending on a mental reflex to get the thing when it should be gotten by direct action, I agree with Dr. Campbell that if a patient bites here or there, one should not worry him or get worked up about it, as he will bite correctly if you do not stress the point too much. I always believed it good practice to get a graphic registration of jaw movements, as this may be used to check the bite position, and, if jaw movements are unhampered, will determine the point from which jaw movements take place. When I have the correct rest bite, the remainder is very simple technic.

The proposition of a vacuum as created by compound impressions is another kind of technic, but time will not permit me to discuss it.

I have found it good practice to promise patients a little less than we know down in our hearts we are able to deliver, and, having made such a promise, we should try to the limit to deliver just a bit more than we have promised. This, in my opinion, is very good psychology.

John H. Hospers: Dr. Campbell has presented every phase of the subject except one, which he might have added, namely, diagnosis. There are a great many men in the profession who fail in diagnosis. We see it every day in our offices when patients come to us who are not properly treated by dentists. You might almost call it malpractice. How often do we see a patient with a full denture in which the lower six anteriors are the only ones that are remaining in place. You are doing a great injustice to that patient by forcing on him the preconceived notion that he does not

want a lower denture because it will not be satisfactory. Many of our full upper dentures fail primarily because we do not have the proper occlusal stress from the lower surface.

Dr. Campbell spoke about lack of confidence in a patient, and said that if he had a choice between the two, he would rather not have an overconfident patient. I agree with him in that respect. Here is another place where diagnosis comes in. It means the previous preparation of the patient in the selling of the case as an absolute essential. Every patient ought to be prepared when he sits in the chair as to what he should expect from the service you are to render.

It seems to me that the psychologic phases of full denture prosthesis apply to the dentist as well as to the patient. This cannot be a one-sided affair. It takes two people to make a bargain and two to fulfil it. No dentist can assume the full responsibility for the success or the failure of a denture. The dental profession, by their haste to assume responsibility, have trained the public to feel that all the responsibility rests with the dentist; that we alone are responsible, and we alone can correct it.

I have recently been called in consultation on a full upper and lower denture that had been reconstructed seven times and a full year consumed in doing it. The dentist had assumed all the responsibility and the patient was not doing anything to help him. This is common to a great many offices, and it is high time the public assumed some of the responsibility.

The use of study models and roentgen rays to diagnose is a method that carries conviction. Everyone is averse to losing the teeth, and when it is advisable to remove a full denture and substitute for it a man-made article, the prospect from the patient's point of view is a calamity. They have seen too much of so-called "artificial teeth" that look and act in any way but natural. This phase really is one of the most salutary for the dentist, because he will have less difficulty in pleasing and will receive more praise if he does. But he must first convince the patient of the necessity and warn him of the difficulties.

The preliminary business arrangement has its psychologic effect on the transaction. Dentistry is a profession, and of course such a thing as fees or arrangement for payment should never be considered. However, I believe that the statement of a definite price and the time the money is to be paid are of prime importance to both the mental attitude of the patient and operator; also a definite understanding as to the amount of service that is to be given in adjustments.

If an additional fee is to be charged for a treatment of the case, or rebasing, it should be definitely understood by both patient and operator; otherwise, this service should be rendered without any intimation of a charge. The sale of a denture can be considered of psychologic value. If there is any question as to the ability of the patient to pay, let him determine the price and style of denture from a large number of suggestions. Do not let the patient state a price and then adopt the style of service. If a patient has something to do with the selection, he will always be better satisfied, other conditions being equal. Great interest and satisfaction can be aroused by preparing the denture and inserting it immediately after the removal of the teeth. This can be done very successfully in partial cases, but will afford greater surprise in full cases. I know that you would not be satisfied if I failed to mention modeling compound. One mistake made by modeling compound enthusiasts is the frequent and elaborate tests employed during the impression procedure. These tests lead a patient to expect a great deal and in many instances much more than can be delivered.

The mental attitude of the patient is far more favorable when he has been referred by some satisfied patient. One of the greatest problems is the attitude of the friends and relatives of the patients. Oftentimes the patient may leave the office thoroughly satisfied, but the change in appearance that of necessity must follow the insertion of dentures, the consciousness of their presence, the attempt to hide them, produce a feeling of criticism that is sorely taken to heart, and the dentist suffers for it sooner or later by the pressure of friends or relatives. There can be no full responsibility on the part of the dentist. He can only do his best and let the patient do the rest. This responsibility the patient should fully understand when the contract is assumed. A bicycle may be perfect, but it is no use to one who cannot ride.

Dr. Campbell (closing): I want to thank Dr. Schlosser for his remarks about the kind of pattern he insists should be given to the laboratory mechanic as it is in perfect accord with what I had to say.

There is only one thing in which I disagree with Dr. Schlosser, and that is in the matter of fees. We get into the matter of fees in connection with dentures more than in any other branch of the profession. I do not like the idea of selling anything in our work. Maybe we can devise some other scheme. Dr. Schlosser said that if you construct a denture and it is entirely satisfactory, there will be no difficulty about collecting the fee. I do not agree with him. Dr. Schlosser is, I believe, not engaged in actual practice.

THE EFFECT OF DEFICIENCIES IN THE DIET*

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IT IS not possible here to review all the work that has been done on this subject. There have been quite a number of books and papers published in the last few years, and it is desired here to spend more time on such subjects as have not received quite adequate treatment elsewhere, at least not until very recently. Since the mineral constituents of the diet can be analyzed with the greatest accuracy, more space will be devoted to this part of the subject.

Simple Goiter a Result of Iodin Deficiency

Goiter has been recognized for a long time in the Old World, and early explorers observed it in America. As far back as 1688, it was described among the Indians of Peru.[1] In 1787, it was described in Mexico, and at an early date in Central America, especially in Guatemala and Nicaragua. In Edmonton, Alberta, Canada, it was described as very prevalent. Burnt sponge was found to cure the disease, but a cessation of the treatment caused it to return again. It was described in the western part of New York State in 1797, occurring among both the Indians and the settlers, the eastern boundary of the area affected being about 56 miles west of Albany. Many settlers became so alarmed that they returned to New England. In 1825, it was described in Pittsburgh, and in 1789, in Fort Duquesne. It has been reported in a large number of sections in the country, and the general impression has been that it is more widely prevalent among white men than among Indians. Hrdlicka observed it in 1916 among the Sioux, the Black Feet and Two Kettle Indians of the Cheyenne River and the Sioux Indians of Fort Yates. It was not until the compilation of data by the draft board that a very adequate survey of the goiter in this country was made. This data will be considered later in the form of a map. The board studied only goiters that were too large to permit buttoning a military collar, and data were compiled only for men between the ages of 19 to 29. As regards the relation of these large goiters to the total number of goiters, we find that Addis and Kerr at Camp Lewis, Washington, found about ten times as many goiters, counting all sizes, as those recorded by the draft board. When it comes to children, sometimes even a higher percentage is noted. For instance, in St. Paul, Minn., in January, 1924, the commission of education reported in the Humboldt High School, 73 per cent of the girls with goiter and 58 per cent of the boys. In Michigan, Owen reports that 70 per cent of the girls and 58 per cent of the boys of Houghton County showed goiter. In the State of Washington, Dr. David C. Hall has made a survey that showed a very high percentage in the school children. The chief interest of this is that many of these school children lived all their lives in the locality in which they were examined; whereas, the adults examined by the draft board had

*From the Laboratory of Physiologic Chemistry, University of Minnesota.

1. Vaughn, V. C.: Epidemiology and Public Health, 1924.

migrated considerably. The State of Washington is very goitrous. The survey of the school children showed that goiter was less prevalent on the shores of Puget Sound than in the mountains and was practically absent in the school children who had lived all their life in the San Juan Islands in Puget Sound.

Iodin was discovered by Courtois in 1811-1812, and it was immediately used as a panacea. Dumas and Coindet, in 1820, used iodin in the treatment of goiter. Coindet was a clinician and Dumas a chemist.[2] Thyroid preparations and burnt sponge, both containing iodin, were used about 4,000 years ago by the Chinese, but not in a scientific manner. Even the chemist Dumas did not know that iodin was contained in the thyroid gland. The idea that a deficiency of iodin was the cause of goiter is ascribed to Chatin, who observed that there was goiter in regions in which the water was low in iodin, the Rhone Valley, Tarentaise and Maurienne; and certain nongoitrous regions, of the Seine, Yvonne and other rivers, contained iodin in the water. But, after some study, Bebert and Saint-Lager found an exception to this rule, and the idea fell into disrepute.

The germ theory of disease entirely suppressed for many years all other ideas, and this was true of goiter as well as of other diseases. It had been observed that certain regions with satisfactory water supplies were goitrous regions, and when the germ theory of disease was advanced, it was immediately supposed that this water contained germs. The fact that iodin cured simple goiter was explained by its mild antiseptic action, assuming that it killed the germs in the intestine, before they entered the blood stream. No account was taken of the fact that small doses of iodin cured goiter and had absolutely no antiseptic action when mixed with food. People were grasping at straws for an explanation, and they did not require that it be logical or even possible. It was shown that the iodids were just as effective as iodin, if not more so, in the treatment of goiter, and that the iodids, except in absolutely pure form, to the exclusion of other salts, have no antiseptic action whatever and hence have no antiseptic action in the human alimentary canal or anywhere in the body.

Baumann, in 1895, discovered iodin in the thyroid gland.[3] He and his followers attempted to isolate the iodin compound in the thyroid gland that was effective physiologically. This was at last accomplished at Rochester, Minn., by Kendall, who named the compound thyroxin. This substance has been isolated in pure crystalline form and its elementary composition is absolutely known. When given by mouth or injected into the body in quantities of 1 mg., it has been found effective; but this effect is somewhat delayed, reaching its maximum in about ten days after administration. This small quantity raises the basal metabolism in quite a marked degree. It also raises the basal metabolism of normal persons. When given to a cretin, in whom the thyroid is absent or functionless, it raises the basal metabolism to normal. When given early enough, it prevents cretinism or any symptoms of a deficient activity of the thyroid gland.

There is room for the use of logic in considering the possibilities and probabilities of the effect of iodin deficiency.

In the first place, it has been proved that every normal thyroid gland contains iodin. It is assumed that all of this iodin is already in the form of or later develops into thyroxin. There is a dispute as to the thyroid gland of the new-born, but as the methods of analysis are being improved, chemists are beginning to show that the supposed absence of iodin in the thyroid gland of

2. Communique a la Soc. helv. des. Sc. Nat. dans. sa seance du 25 juillet, 1820.

3. Baumann: Ztschr. f. Phys. Chem., December, 1895.

the new-born is to be interpreted as meaning that there is only a small amount there. The body cannot synthesize iodin; it must have it supplied in food or drink. Without iodin, the body must show the symptoms of cretinism or hypothyroidism whether the thyroid gland was previously normal or not. However, it is rather improbable that there is ever a total absence of iodin in any human being.

The enlargement of the thyroid gland without evidence of disease is probably one of functional hypertrophy. If we cut out one kidney, the other kidney grows to twice its size. If we anastomose one ureter with the duodenum so that the urine is reabsorbed, both kidneys show functional hypertrophy because of the extra load put on them. The anastomosed kidney cannot know that its work is futile; it continues to operate at an increased rate although all the urine it excretes is being reabsorbed in the blood again, and thus we get hypertrophy of both kidneys. The function of the thyroid seems probably to be the production of thyroxin out of iodin. Under the simplest conditions, the rate of a chemical reaction is proportional to the product of the concentrations of the two reacting substances (in this case there are just two.) If we assume that, in the thyroid gland, one of these substances is iodin and the other substance is of constant concentration; and if we lower the concentration of iodin, in order to produce the same amount of thyroxin, we must increase the size of the gland in order to increase the amount of the other reacting substance. Something of this nature seems to be at work, and when iodin is deficient, the gland enlarges at such a rate that the amount of thyroxin produced is normal. This would explain also the results of the iodin analyses of the thyroid glands. In simple goiter, which is apparently functional hypertrophy of the gland, the concentration of iodin is always lower, but the total amount of iodin in the whole gland may be nearer normal, owing to the increased size of the gland. The decreased supply of iodin through many generations, however, seems to alter pathologic processes. It is very possible that thyroxin after passing into the body, doing its work and being decomposed, liberates iodin, which is carried back to the thyroid and made into new thyroxin. In this way, the quantity in the body is more or less conserved, but there may be a gradual leakage out. At any rate, in goitrous regions, after about three generations of goiter, there appear what are known as cretins. Cretins may or may not show a marked atrophy of the thyroid gland. Sometimes, no thyroid tissue worthy of the name is found at all, and the metabolism shows that there is no thyroxin produced in the body. Yet if cretins are treated early enough and are fed thyroxin or thyroxin-containing preparations in frequent doses, they may develop normally and lead a normal life. Just as soon as thyroxin is stopped, symptoms of hypothyroidism appear.

Not only is simple goiter and cretinism the result of iodin deficiency but iodin also has a relation to exophthalmic goiter.[4]

To come back to the question of the relation of goiter to water supplies: in the light of what has been discovered in the chemistry of the thyroid gland, the problem presents itself as a matter of working out the details. There are very numerous reports of the association of goiter with water supplies; for instance, McCarrison's in the Himalaya Mountains. We receive our supply of iodin not only through water but also through food. Most of the iodin in the world is in the sea, which contains sixty-six bil-

4. Eggenberger, H.: Resultat des ersten Jahres der freiwilligen Kropfbekampfung in Appenzell, A. Rh. Report of the Red Cross Section for Herisau, June 8, 1923. Plummer, H. S.: J.A.M.A., 77:243 (July 23) 1921. The fact that exophthalmic goiter shows the same relative distribution as simple goiter is denied to be true in England by Campbell, J.A.M.A.

lion metric tons of iodin, although the concentration is only about 0.04 of a part per million in sea water. Seaweeds growing in the sea concentrate iodin so that dried kelp may contain 0.1 per cent of iodin. Fish, by eating seaweed, get their supply of iodin. There is very little or no goiter among marine fish. Likewise, all other sea animals get their supply of iodin from sea water or plants.

Studies Showing Goiter the Result of Iodin Deficiency

The older determinations by Chatin were not so accurate as the modern work, but, because of the large number of analysis which he made, we believe that his evidence holds good today in a general sense. It seems, therefore, permissible to recall it. Chatin's work came not many years after the discovery of iodin by Courtois in 1811, and the treatment of goiter with it by Dumas and Coindet in 1820; and although thyroid and other iodin preparations were used about 4,000 years ago by the Chinese, scientific iodin therapy cannot be considered to have begun until the discovery of iodin. Muller [5] discovered the presence of iodin in water cress, and Chatin in 1850[6] extended these analyses to fresh water plants of various species. He found that they apparently took iodin from the water and extracted it at a rate in proportion to that at which it was brought to them by the water. The Paris Academy of Science appointed a commission[7] to verify these results, and it reported favorably. The findings were extended by Meyrac,[8] Personne[9] and Bussy.[10] Chatin[11] then extended his findings to fresh water plants of all continents, and to terrestial plants and animals. He found iodin also in the water in which the plants grew. He pointed out a possible source of error in that commercial potash contained iodin derived from the plants, from the ashes of which it was extracted. He found iodin in a specimen of sea salt, but could not detect any in rock salt. Rivers fed by glaciers had very little iodin. On account of this and the prevalence of goiter along such rivers, he advanced the hypothesis that lack of iodin in drinking water is the cause of goiter. Marchand[12] said that Cantu of Turin was the first to find iodin in drinking water. Chatin found it even in rain water, especially near the sea, and he supposed that the iodin was derived from the sea water and, passing up into the atmosphere, was brought down by rain. In this hypothesis, he was supported by Fourcault.[13] Chatin [14] next systematically analyzed iodin of the air, water, soil and food products of the Alps, France and Piedmont, in order to study the relation of iodin starvation to goiter. He found that, passing toward the Alps, the iodin in the atmosphere decreases and becomes very low in the valleys of the Isere, Maurienne and Tarentaise, but at the end of certain long winds, the atmosphere suddenly became richer in iodin. Passing from the Alps into Piedmont, the iodin increased again. Similar relations were found in the iodin of the waters and the soils. All these data were shown to the Paris Academy of Science in tables, but were not published in detail in the *Comptes Rendus*. While he does not state just what data he obtained on goiter, it is well known that there were a considerable number of persons excused from military service

5. Muller, quoted by Lindley, in The Vegetable Kingdom, London, p. 363.

6. Chatin, A. D.: Compt. Rend. Acad. d. Sc., 30: 352, 1850.

7. Thenard, Gaudichaud and Bussy: Compt. Rend. Acad. d. Sc., 30: 467, 1850.

8. Compt. Rend. Acad. Sc., 30: 475, 1850.

9. Compt. Rend. Acad. Sc., 30: 478, 1850.

10. Compt. Rend. Acad. Sc., 30: 537, 1850.

11. Compt. Rend. Acad. Sc., 31: 280, 1850.

12. Marchand: Compt. Rend. Acad. Sc., 31: 495, 1850.

13. Fourcault: Compt. Rend. Acad. Sc., 33: 518, 1851.

14. Chatin: Compt. Rend. Acad. Sc., 33: 529, 1851.

on account of goiter, and records were kept of these. Chatin found that those parts of the Alps which were very low in iodin were highly goitrous. He used the starch iodid test on the addition of nitric or sulphuric acids to show the presence of iodin. At about this time, Grange[15] observed that nitrous acid would oxidize iodid to iodin. This is better than nitric acid since the latter oxidizes chlorid to chlorin and bromid to bromin, and the chlorin may react with iodin and the bromin interfere on account of its color. It is now known that, in order to obtain blue with starch, both iodid and iodin must be present, and the detection of iodin by starch depends on the fact that not all of the iodid is oxidized to iodin, this being the case only with stronger solutions. Grange found that solutions containing one part per million or less do not give constant results, and, in the latter case, he used a method of Rabourdin of extracting the iodin with chloroform, in which it is pink. It is not clear whether Chatin used Grange's method in his later work, but the commission appointed by the Academy recommended that Chatin express his results in milligrams, and this unit is used in Chatin's later reports.

Chatin[16] observed the disappearance of iodin from water by evaporation and the passage of iodin over in the distillate in distillation. In order to determine its presence in the atmosphere, he passed air through Liebig's potash bulbs and was able to find one five-hundredth mg. in 4,000 liters of the air of Paris. He also found more in inspired air than in expired air, and assumed that it was absorbed by the alkali of the blood in the lungs.

In analysis of soils, Chatin used only 1 to 20 gm. of earth and extracted this with water. He found that food contained different amounts of iodin according to the different soils in which it was grown. This is true not only of wheat but also of milk and cheese. Chatin[17] reports the amount of iodin in what he estimates to be the daily intake of food, drink and air for each person. Strange to say, he found about the same amount of iodin, as a rule, in each, from the same locality, and could extract about this same quantity from about 10 gm. of soil from the same locality. There were some exceptions, since rain water did not contain exactly the same amount as river water, and we will find it convenient to express these quantities with the word "ration"; one ration of water being about 1 to 2 liters; one ration of air being 8,000 liters, and one ration of food being made up of the amounts of various food ingredients consumed in one day. He divided the country into certain zones. The first was the zone of Paris (containing no goiter), in which one ration of air contained one two-hundredth mg. of iodin; one ration of rain water contained one one-hundred and fiftieth mg. of iodin; one ration of river water contained one three-hundredth mg., and 10 gm. of soil one two-hundredth. The second zone was the Soisonnais, the valley of Montmorency and Morin. Goiter was rare and cretinism unknown. Analyses were not very different, except that the hard waters contained no iodin. The third zone in the region of Lyon, one ration of air, one ration of rain water, one of drinking water or 10 gm. of soil contained from one four-hundredth to one one-thousandth mg. of iodin. In the fourth zone, of Turin and Claremont, one ration of drinking water had less than one one-thousandth mg. of iodin. In the fifth zone, the high Alps, 10 gm. of soil or one ration of drinking water contained less than one one-thousandth mg. of iodin. In the sixth zone, the deep valleys of the Alps, in which cretinism

15. Grange: Compt. Rend. Acad. Sc., 33: 627, 1851.

16. Chatin: Compt. Rend. Acad. Sc., 32: 667. 1850.

17. Chatin: Compt. Rend. Acad. Sc., 34:14, 51, 1852; Gaz. d. Hôp. Civ. et Mil., 25: 14, 39, 50, 82, 87, 94, 95, 1852.

was very prevalent, 10,000 liters of air or one ration of rain water or one ration of river water or 10 gm. of soil furnished one two-thousandth mg. of iodin or less; in other words, down to the lower limit of his qualitative test. Chatin calculated that goiter could be prevented by importing food from nongoitrous regions, or by the use of iodized salt, which had already been advocated by Boussingalt[18] and Grange; or by giving the food-animals iodin, or fertilizing the food-plants with iodin.

Chatin[19] analyzed sewage for iodin. He apparently had some difficulty with large amounts of urine interfering with the iodin determinations. He found, however, that iodin in the sewage of Paris was greater than in the Seine, and this may prove that the iodin content of the Seine was increased by passing through Paris. He[20] also studied the water supplies of London and Turin as regards the avoidance of water containing low amounts of iodin, and advised people using well water around Paris to substitute rain water for drinking purposes. It is probable, however, that this rain water did not contain any more iodin than the well water, but that the chlorids of the well water interfered with the determination of iodin.

The Paris Academy of Science appointed a second commission[21] to investigate the correctness of Chatin's later work. This commission accepted Chatin's analyses of iodin but did not accept his conclusions about goiter.

Chatin[22] investigated two villages on the right bank of the Rhone, one of which, named Fully, contained many cretins. The other, Saillon, was free from goiter and cretinism until recently, when the water supply had been changed from a spring flowing into the Salente to the water of the Salente above the mouth of the spring. Chatin found this spring high in iodin, thus explaining the former freedom from goiter of the town receiving the water.

Although Chatin expressed his results in milligrams of iodin and the values were extremely low, Casaseca[23] read into Chatin's work the assumption that, in regions free from goiter, the iodin in the food and drink should be high. He found in the river Almandares, in the goiter-free island of Cuba, only about one part of iodin in 50,000,000 parts of water. He also detected no iodin in ashes of the banana or of corn but found it in the ashes of water cress. Casaseca supposed that these facts overthrew Chatin's hypothesis, but from present data, it is evident that they are more of a confirmation.

A third commission[24] appointed by the Paris Academy of Science to examine Chatin's work supported his analyses but would not accept his conclusions about goiter. It was not possible for the members of the commission to attribute any virtue in one four-hundredth mg. of any substance whatsoever. Saint Lager,[25] in 1867, opposed Chatin's conclusion on the ground that Cantu had found iodin in waters of Piedmont used by goitrous persons; Bruner had found iodin in a goiter spring in Berne, and Bebert had found iodin in a goiter spring in Savoy. He also reiterates Casaseca's objections. Furthermore, de Jean, Germain and Moretin could find no iodin in the waters of the Jura, which are drunk both by populations in which goiter is not endemic and by goitrous populations. The Lombardy commission found iodin in

18. Boussingalt: An. Chem. et Physiol., 48.

19. Chatin: Compt. Rend. Acad. Sc., 35: 46, 1852.

20. Chatin: Compt. Rend. Acad. Sc., 35: 127, 1852.

21. Marchand, Niepce, Meyrac: Compt. Rend. Acad. Sc., 35: 505, 1852.

22. Chatin: Compt. Rend. Acad. Sc., 36: 652, 1853.

23. Casaseca: Compt. Rend. Acad. Sc., 37: 348, 1853. Chatin: Compt. Rend. Acad. Sc., 37: 723, 1853.

24. Compt. Rend. Acad. Sc., 37: 934, 1853.

25. Saint-Lager: Etudes sur les Causes du Crétinisme et du Goitre Endémique, Paris, 1867.

many localities in elevated valleys where cretinism is unknown. This is taken as an example of the attitude in which Chatin's work was received. It is not possible for us to review all the literature on this subject, but apparently the general attitude has been that goiter was the result of a germ and that iodin was a germicide. Apparently, no consideration has been taken of the fact that the minute concentrations of iodin determined by Chatin can have no germicidal action no matter what the oxidation stage of the iodin is, and, furthermore, it is mostly in the form of iodid, iodate or organic compounds that are practically nongermicidal in any quantities when mixed with blood or other biologic fluids.

Recently, Marine and Kimball[26] have brought forth overwhelming evidence that adolescent goiter may be prevented by the use of iodin, and this work has been continued by the Swiss. The chief advocates in Switzerland of iodin prophylaxis are Dr. H. Hunziker and Dr. Hans Eggenberger. In 1915, Hunziker[27] gave the results of some years' administration of potassium iodid in one-tenth mg. doses daily. This caused reduction in the size of goiters, but in about a year they began to grow again. Iodin therapy caused them to decrease again. He states that, since in large goiters the connective tissue and blood vessels hinder the complete reduction back to normal size, it is proper to give goitrous populations enough iodin to prevent goiter. The simplest way to do this is to mix small amounts of iodin in salt. This work has received considerable opposition in Switzerland on the ground that the use of iodin might transform the benign thyroids into toxic goiters. It is important here to note that Eggenberger[4] makes the statement, in a report, June 8, 1923, that, for exophthalmic goiter, the iodized salt is not contraindicated, but on the contrary, has been beneficial; and that simple-goiter-free countries are also free from exophthalmic goiter.

In the United States, we have made a rough survey of the iodin in drinking waters; using an improved method.[28] The country may be roughly divided into regions of low and high goiter incidence.[29] This is shown in Figure 1. The exact line dividing these two regions is rather doubtful owing to the migration of persons with goiter, and the fact that the surveys have been made along state lines and larger fractions than states. In the accompanying map, the region above the heavy line is the region of high goiter incidence, there being more than five goiters in each thousand drafted men; and the region below the heavy line is of low goiter incidence, there being less than five in each thousand drafted men. This line serves well to separate the low from the high iodin content of water. There are a few exceptions, some of them due to the fact that natural waters were contaminated by human agencies, and others to the fact that torrential rains diluted the iodin in the water; but in a majority of cases, the region above the heavy line contained from one to sixty parts of iodin per hundred billion parts of water, and the region below the heavy line from sixty to twenty thousand parts of iodin per hundred billion parts of water. The same line serves to show the regions of high and low exophthalmic goiter according to the draft board. The region above the heavy line shows more than 2.85 cases of exophthalmic goiter in each thousand drafted men. The region below the heavy line shows less than 2.85 in each thousand. In other words, there is an inverse relation between iodin and goiter.

26. Marine, David, and Kimball, O. P.: J. Lab. and Clin. Med., 3: 40, 1917.

27. Hunziker-Schild, H.: Der Kropf, eine Anpassung an jodarme Nahrung, Bern, 1915, p. 23.

28. McClendon, J. F.: Determination of Iodin in Food, Drink and Excreta, J. Biol. Chem., 40:289, 1924.

29. McClendon, J. F., and Hathaway, J. C.: Inverse Relation Between Iodin in Food and Drink, and Goiter, Simple and Exophthalmic, J.A.M.A., 82:1668 (May 24) 1924.

Where iodin is low, goiter is prevalent. Where iodin is high, goiter is rare or absent. By means of metabolism experiments, we showed that a man who failed to contract goiter when living in a goitrous region retained about 0.01 mg. of iodin each day from his food and drink. Since his body is estimated to contain about 20 to 40 mg. of iodin, it might have taken him from 2,000 to 4,000 days to accumulate this store; in other words, perhaps around ten years. If we examine the amount of water, we find that it would take him a long time to accumulate this much from water containing sixty parts per hundred billion. He would have to drink 200 liters of water to accumulate 1 mg. of iodin. In other words, it might take him more than forty years to accumulate this amount of iodin. If he started at birth to drink this water at the rate of 2 liters a day, which is rather a large quantity, he would be about 40 years old before he had accumulated enough iodin to protect a man from goiter. But he would certainly show signs of goiter during this period, and after the goiter had grown to some size, gradual accumulation of this iodin would not reduce it completely owing to the fact that the connective tissues and blood vessels would not lessen in size.

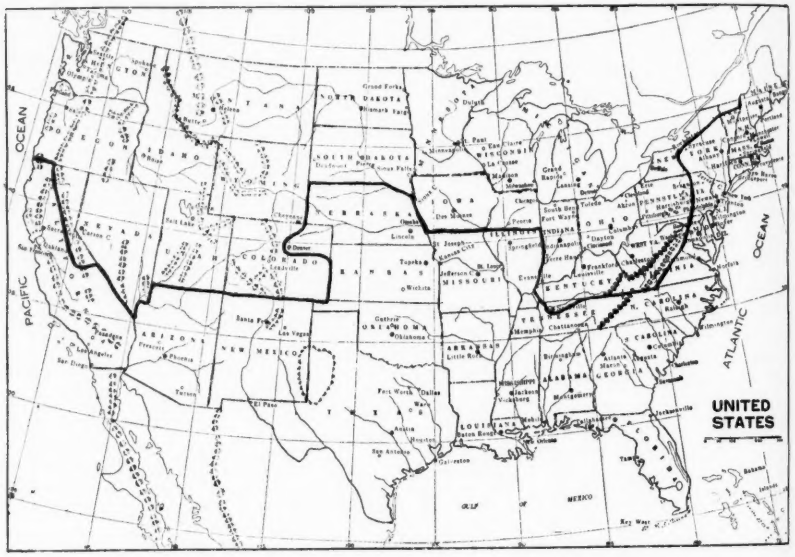

Fig. 1.—The area above the black line contained more than five "military" goiters (goiters large enough to prevent buttoning a military collar) and 2:85 exophthalmic goiters per thousand drafted men, and from one to sixty parts of iodin per hundred billion parts of drinking water. The area below the line contained less than 5 military goiters and 2:85 exophthalmic goiters per thousand drafted men and from sixty to 20,000 parts of iodin per hundred billion of drinking water.

How then are sixty parts per hundred billion going to protect from goiter? The answer is that we not only get iodin from water but also from food. Ultimately, the food depends for its iodin on water. Plants suck up water from the soil and evaporate the water from the leaves but retain the iodin. Animals eat these plants and we eat both plants and

animals. In this way, we obtain the iodin from a rather large quantity of water. In a goitrous region, the one foodstuff produced which contains the largest amount of iodin is butter. Green leaves contain a fairly high amount, but owing to our limited capacity to eat these leaves, we are limited in the amount of iodin we can thus obtain. In a nongoitrous region, these same plants contain much more iodin. For instance, carrots grown in a goitrous region contain 2.3 mg. for each metric ton of the dried carrots; whereas, carrots grown in a nongoitrous region contain 170 mg. for each metric ton. Milk from a goitrous region contains about 7 mg. of iodin per ton and 6 gm. are in the butter fat. Skim milk produced in a goitrous region contained 12 mg. of iodin for each metric ton of the dry milk, and butter, 140 mg.; whereas in a nongoitrous region, goats' milk contained 400 mg. of iodin for each metric ton of the dry milk. We get very little iodin from cereals, but those grown in a nongoitrous region contain much more iodin than those grown in a goitrous region. To show the small amount of iodin in the cereals from goitrous regions, an analysis of wheat and its milling products is given in the accompanying table.

AMOUNT OF IODIN IN CEREALS

	Per Cent	Iodin in 1 Ton or Fraction Mg.	Iodin in 1 Ton of Wheat Mg.
Straight flour	68.2	3.5	2.38
Bran	21.2	15.5	3.285
Shorts	9.4	9.6	0.902
Red dog	1.2	3.7	0.044
	100.00		6.611

A simple method of preventing goiter is to take iodin in some form. One might consider tablets the most convenient form. It has been calculated that it has been possible to sell tablets for this purpose, the iodin selling at $900 a pound; whereas, pure iodin sells for about $4.00 a pound. Various persons would forget to take the tablets. Therefore, a more certain method of administering iodin is by putting it in city water supplies. It has been said that a large amount is wasted in washing and irrigation. From an economic standpoint, this may not be a waste, because, if we can obtain iodin for this purpose at $4.00 a pound, whereas tablets might cost us on the iodin basis, $900 a pound, or if they were put down to the minimum iodin content that is required, say, $50,000 a pound, we can afford to waste a little of the iodin. Furthermore, if some of the wasted water is used to fertilize gardens, the iodin will be retained in the food. We have calculated that one-tenth pound of sodium iodid in each million gallons of drinking water should protect the population from goiter. Sodium iodid has been added to the water of Rochester, New York,[30] and to that of Sault St. Marie, Mich.

Such iodized water would not be available to campers. It has been shown, however, by Major A. P. Hitchens, of the Medical Corps of the Army, that iodin is a very convenient water purifier for campers. The method of purification is as follows: One drop of tincture of iodin is added to a quart of water and stirred or shaken until mixed. After thirty minutes, all harmful bacteria are killed and the water is absolutely safe to drink. The amount of iodin added is too slight to taste. This amount of iodin is ample to protect from goiter.

The use of disclosing fluid or other iodin preparations in the mouth serves to add to the body's store of iodin.

RICKETS AND PHOSPHATE DEFICIENCY

Since the differentiation of rickets by Glisson,[31] the number of drugs used in treatment has been very great and a few that concern us will be mentioned

30. Benedict, Abner: Iodide of Soda in the Drinking Water, Bull. Health Bureau, Rochester, New York, May, 1923, p. 2.

31. Glisson, F.: Tractatus de rachitide sive morbo puerili, qui "the rickets" dicitur, 1650, London.

here. Schenck found cod-liver oil very effective and his findings were confirmed by Osberghaus.[32] A number of calcium and phosphoric acid compounds were used in treating rickets.[33] Animals whose bones develop rapidly must necessarily have an abundance of calcium phosphate in their milk. The feeding of such milk to rachitic children is discussed by Rehn.[34] Wendt and Foucroy supposed rickets to be due to a disproportion between calcium and phosphoric acid, and just recently Sherman and Pappenheimer showed that rickets could be produced by deficiency in phosphoric acid.[35] Guerin, and later Chossat,[36] showed that calcium starvation caused porous bones in animals, but not soft bones. More recently Park and collaborators showed that a low calcium diet causes rickets.[37] The idea was advanced that rickets was due to a failure to absorb calcium compounds in the food, and Seemann[38] supposed the cause of rickets to be the absence of sufficient hydrochloric acid in the stomach to make the calcium of the food soluble. A somewhat similar view was that phosphoric or other acids dissolved out the calcium phosphate from the bones (*acrimonia rachitica*). Such action of lactic acid was contested experimentally by Baginski.[39] In his study of phosphorus poisoning, Wegner[40] found that fowls fed distilled water and extracted food and given phosphorus, developed rickets; whereas various animals on normal diet, when given phosphorus, developed abnormalities in the bones just as they developed abnormalities in the liver. This led Kassowitz,[41] adopting a sort of homeopathic philosophy, to try phosphorus in rickets. Kassowitz sometimes dissolved the phosphorus in cod-liver oil and sometimes in other oils. Cod-liver oil was recommended in those days on account of its cheapness, and Kassowitz does not state what proportion of the patients received cod-liver oil. Rachfuss in discussing Kassowitz's paper pointed out that many of the patients would have recovered without treatment and that there was a seasonal variation in the severity of the cases. Schabad[42] showed that cod-liver oil increased calcium phosphate retention in rickets; whereas, phosphorus decreased retention. On the basis of one or two determinations in which he observed that a greater retention of calcium phosphate resulted from dosing with phosphorized cod-liver oil than resulted from dosing with plain cod-liver oil, he concluded that phosphorus increased the activity of cod-liver oil. We now know that cod-liver oil varies in vitamin content, and Schabad does not state that his two samples of cod-liver oil were from the same source. It might seem plausible that phosphorus may prevent the destruction of vitamins by oxidation. At any rate, the vitamins are not completely destroyed by the reducing action of phosphorus. The fact that phosphorus changes the bones as it changes the liver does not mean that it cures rickets. Wegner obtained enormous overgrowth of bones from phosphorus in normal animals, and if it

32. Osberghaus: Froriep's Notizen aus dem Gebiete der Natur und Heilkunde, 12:48, No. 3, 1824.

33. Meissner, F. L.: Kinderkrankh., Leipsic, 2:276, 1828.

34. Gerhardt, C.: Handbuch d. Kinderkrankh., Tübingen, 3:119, Pt. 1, 1878.

35. Sherman, H. C., and Pappenheimer, A. M.: Proc. Soc. Exper. Biol. and Med., 18:193, 1921.

36. Chossat, C.: Mem. Acad. Sc. Inst. de France, Series 2, 8:438, 1843.

37. Park, E. A.: Shipley, P. G.: McCollum, E. V., and Simmonds, Nina: Soc. Exper. Biol. and Med., 14:149, 1922.

38. Seemann: Arch. path. Anat. u. Physiol., 77:299, 1879.

39. Baginski, A.: Arch. Anat. u. Physiol., Physiol. Abt., 1881, p. 357.

40. Wegner, G.: Arch. path. Anat. u. Physiol., 55:39, 1872.

41. Kassowitz, M.: Arch. f. Kinderheilk., 5:126, 1884.

42. Schabad, J. A.: Ztschr. klin. Med. 69: 435, 1910.

could be shown, as Schabad failed to do, that phosphorus increases calcium phosphate retention, it does not necessarily prove that it cures rickets, especially if the diet was such that the patient would get well anyway. The effect of phosphorus is still an open question. There seems to be some misunderstanding about phosphorus and anhydrous phosphoric acid compounds in relation to rickets. The analyses for phosphates in organic materials have usually been put in terms of P_2O_5 (anhydrous phosphoric acid) but sometimes in the terms of P. No foodstuffs contain other compounds of phosphorus than those containing the PO_4 radical, as in phosphoric acid, for instance. When phosphoric acid is heated, water is driven off, and it might change to pyro-phosphoric acid, then meta-phosphoric acid, then anhydrous phosphoric acid if it were possible to heat it sufficiently, but on standing in water solution, anhydrous phosphoric acid changes into orthophosphoric acid (H_3PO_4). Phosphorus, either yellow or red, which is intensely poisonous, owing perhaps to its reducing action, was studied by Wegner because it was a favorite means of committing suicide in those days. Wegner had no idea whatever of any therapeutic action. However, even in so careful a review of literature as is contained in Funk's "Vitamines,"[43] the use of phosphorus in the treatment of rickets is confused with the effect of phosphates in the diet. If phosphorus is taken by mouth and the patient is not killed, it is gradually oxidized to phosphorous acid and phosphoric acid, but the quantity the patient may oxidize before death ensues is very small and could have no therapeutic action in rickets as phosphate.

The study of rickets has taken on a new aspect since the discovery of vitamins. According to Parke, McCollum and their co-workers, there are two kinds of rickets, one due to lack of calcium and one due to deficiency in phosphoric acid in the diet; and cod-liver oil benefits these conditions. McCollum and his co-workers[44] found that butter fat was not nearly so effective as cod-liver oil in the prevention of rickets; in fact that butter fat had only a very slight action.

As a result of a large number of experiments on white rats in this laboratory, it seems that we can harmonize and summarize the results of various workers on rickets in the following manner. Rickets is primarily a defect in the phosphate metabolism of the young. Probably, a similar disease, called osteomalacia, is a defect in the phosphate metabolism of the adult. The phosphate metabolism depends on many factors: (1) phosphate intake; (2) phosphate absorption, and (3) phosphate excretion. The phosphate intake can be accurately analyzed by the phosphate of the diet. The phosphate absorption and excretion cannot be absolutely separated. The phosphate is absorbed from the intestine, but it is excreted by two routes, partly through the intestine and partly through the kidneys. It has not yet been possible to separate the excretion through the intestine from the absorption. We know that calcium phosphate is insoluble in an alkaline medium. The human intestine, however, in the great majority of instances, is acid throughout except in case alkali has been taken as a drug. Certain factors influence the phosphate-metabolism, probably by lessening the excretion of phosphate. One of these is the so-called antirachitic vitamin, or vitamin D, which is present in cod-liver oil and to a lesser extent in other foods. Sunlight or any light containing a large number of ultraviolet rays, that is to say, any light which tans or blisters the skin, seems to influence favorably phosphate metabolism. It is possible that the vitamin D is synthe-

43. Funk, C.: Vitamines, Ed. 2. Baltimore, Williams & Wilkins Company, 1922.

44. McCollum, E. V.: and others: J. Biol. Chem., 50:5-30 (Jan.) 1922.

sized in our skin when it is exposed to the extent that it is reddened or tanned. It has often been supposed that a high intake of calcium would lessen the absorption of phosphate or that the taking of alkali would render the phosphate in the intestine insoluble. Experiments on rats, however, have not always favored these assumptions.

The nature of this antirachitic vitamin is quite obscure; but the fact that there are at least two vitamins in cod-liver oil should be emphasized. One of these, vitamin A, can be demonstrated by the fact that, in its absence, the eyes become diseased, the condition being known as xerophthalmia. Vitamin A may exist independently of vitamin D; for instance, dried spinach contains a large percentage of vitamin A, but vitamin D is practically absent in this food. Figure 2 shows a rat that contracted xerophthalmia owing to lack of vitamin A in the diet. This rat was later given a gram of dried spinach each day for four days. The effect is shown in Figure 3, the eyes being bright and in a healthy condition. A large number of experiments failed to show any antirachitic effect with dried spinach. It is interesting to note that Huston and Lightbody announced that hydroquinone protects against xerophthalmia and acts as an antirachitic vitamin.

Fig. 2.—White rat showing xerophthalmia (disease of the eyes) due to lack of vitamin A in the diet.

Fig. 3.—Same rat as in Figure 2 after taking 1 gram of dry spinach a day for four days. The eyes are healed.

Osteoporosis and Calcium

A great deal of early work was done in the attempt to show that lack of calcium in the diet might produce rickets. The first reports were that rickets had been produced, but on more careful examination of the results of such feeding experiments, a difference was detected between these effects and true rickets. The condition that resulted from lack of calcium was one of osteoporosis, and in order to emphasize the fact that failure to produce rickets had resulted, this condition was called "pseudo rachitic osteoporosis." In order to show the distinction between these conditions, an experiment on white rats on a low and high calcium intake is described. By decreasing the calcium in the food, it was possible to lower the calcium retention to one-fourth the normal. In this case, the volume of bone substance was reduced to less than half the normal. This was

determined by means of measurements of the thickness of the walls of the long bones. For instance, in the normal rats, the thickness of the walls at a certain level in the shaft of the tibia was an average of 14 units; whereas, thickness of the walls on a low calcium diet averaged 7 units. The diameter of the narrow cavity of the normal showed an average of 20 units; whereas that on a low calcium diet was 27 units. Otherwise, the bones seemed to be normal in structure and appearance. Some studies indicate, however, a widening of the Haversian canals and canaliculi in osteoporotic bones.

In rickets, a very different picture is presented. The first abnormality to be seen is in the growing area. New bone is laid down in large amount; in fact, more abundantly than usual; but it is not mineralized and remains soft. This soft bone is called "osteoid tissue." If long continued, the disease results in a demineralization of the bone that was formed before rickets developed, although this process is more characteristic of osteomalacia than it is of rickets. The strain of the tension of the muscles and the thrust of other bones on these softened bones causes deformities. Since the growing areas are in the ends of the long bones, the pressure squeezes them out into very much enlarged extremities In case the diet is changed or the growth lessens in rate so that phosphate retention becomes adequate for the amount of new bone that is produced, these ends harden, but they retain their deformities for a long time.

The mineralization of the bones is due to the deposit of calcium phosphate. Failure to deposit this in new bone results in soft bone. Since lack of either calcium or phosphate would prevent the mineralization of bone, the condition of rickets becomes simply a deficiency in mineral matter.

Osteoporosis introduces another factor. When calcium is the element whose deficiency is most marked in the body, the production of the soft part of the bone (collagen) is inhibited, and that which is already formed may be reabsorbed to some extent. There is, therefore, enough mineral matter left for the remaining collagen, so that normal bone persists but in reduced amount. This effect of calcium-want in inhibiting the growth of bone is a special case of the ordinary effect of deficiencies in general. As a rule, we may say that a deficiency of any element in the diet of a growing individual, if severe enough, may result in a stoppage of growth of the whole animal, and it is true that lack of calcium will stop the growth of the whole animal. The first effect of a deficiency of calcium is manifest in the bone tissue, and its growth is inhibited earlier, or to a greater extent, than the growth of the whole body.

Osteoporosis is affected by vitamins. Scurvy is a result of lack of vitamin C in the diet. In scurvy, we have two main symptoms: one is osteoporosis and the other is multiple hemorrhages from the capillaries of the body. The osteoporosis that occurs in scurvy is not simple. In addition to the osteoporosis, there is a production of abnormal bone tissue inside the marrow cavities of some of the bones and the pulp cavities of the teeth. This bone formation in the pulp cavities was first described from this laboratory,[45] but has been more fully worked out by Axel Hoyer.[46] The antirachitic vitamin or vitamin D is said to favor the retention of calcium in a low calcium diet, and thus tends to lessen or prevent osteoporosis. It is announced by McCollum that lack of vitamin B in rats may produce osteoporosis. The usual symptoms from lack of vitamin B are nervous symptoms.

Disturbance of the calcium or phosphorus metabolism may result in an

45. Robb, E. F., and others: J. Dent. Research, 3:39-61, 1921.

46. Hoyer, Axel: Acta Paediat. 3, 1924 (Supplement).

altered percentage of calcium or phosphorus in the blood. Calcium is a depressant to the nerves, whereas, sodium, potassium and hydroxyl ions are nerve irritants. The condition of spasmophilia and tetany is due to a preponderance of the nerve irritant effect due either to lowered calcium or increase in the irritating ions above mentioned. Injection of calcium salts into the blood may temporarily relieve spasmophilia and tetany. With oral administration, complications may arise, which makes the case a little less simple than it first seems. If calcium chlorid is taken by mouth, calcium carbonate is excreted in the feces and hydrochloric acid is absorbed into the blood. Hydrochloric acid lowers the number of hydroxyl ions and thus lessens the irritating action and relieves the tetany. Calcium had nothing to do with it, as is shown by the fact that the same amount of hydrochloric acid taken as such also relieved the tetany. When there is a deficiency of phosphate in the body, probably the bones tend to give up calcium phosphate in the blood, and in this way the calcium content of the blood is restored to normal. Now, if phosphate is injected into the blood, calcium phosphate tends to be deposited in the bones, and the calcium content of the blood is lowered and tetany may result.

Since calcium phosphate in the bones is the tricalcium-phosphate, it is probably desirable to take calcium and phosphorus in this proportion in the food. As shown by Sherman and Forbes, our diets are low in calcium and phosphorus, particularly in calcium. Although [illegible] contains considerable phosphate, it is very low in calcium. The only adequate source of calcium phosphate that can be taken in sufficient quantities by all individuals is milk. Milk is a very essential element in our diet. The elements of milk are derived from green leaves. The cow eats the leaves and changes them into a food that is more adapted to our digestion than are large quantities of green leaves.

Diet and the Teeth

Very little was formerly known about the effect of diet on the teeth. Experiments by McCollum and Grieves have shown that defects in the teeth and dental caries may result from improper diet, but whether there is one or several defects in these diets that are responsible for the defects in the teeth seems questionable. It has long been known that rickets results in poorly developed teeth, which are necessarily subject to decay. Therefore, we may state conclusively, that, for good teeth, rickets is to be avoided, and rickets should be avoided by taking sufficient phosphate and vitamin D in the diet and exposing the skin to light that will produce a reddening or tanning effect. After the permanent set of teeth are acquired, their preservation may still depend on diet. Teeth are bathed with the neutral saliva, which contains calcium and phosphate ions in solution and prevents the enamel (which is almost pure calcium phosphate or perhaps apatite) from dissolving. The teeth may still dissolve, however, from the blood stream, as is very evident of the bones in scurvy, in which we know that the teeth loosen and fall out. The normal dentin becomes absorbed and is replaced by bone tissue, but on the giving of vitamin C, Hoyer has shown that this bone tissue is absorbed and normal dentin produced again. If the teeth have not fallen out, they tighten in their sockets again.

Pickerill compiled statistics to show that the white race had the worst teeth of all races in the world except those that have degenerated through contact with the white race. I believe this conclusion should be greatly modified. The race that, according to Pickerill, had perfect teeth before contact with the white race was the Polynesian. In recent years, the American Museum of Natural History of New York City has sent out expeditions to study these people. Dr. L. R. Sullivan, anthropologist, and Dr. H. G. Chappel, a dentist

of Oakland, Calif., who studied the teeth of the Polynesians, wrote that the teeth were as bad as they could be. In detail, their conclusion is as follows: The teeth of the young children are well developed and in good condition, and this is true of individuals up to the age of about 20. At this age, they may commence to develop a gingivitis, and this condition may increase in severity until, at the age of about 30, they may commence to develop gingival caries under the deposits on the teeth. This condition increases in severity with age and may lead to abscesses and osteomyelitis of the jaw. Caries is not confined to the people who have had contact with the white race but is shown in skulls obtained from graves that antedate the coming of white men.

A condition similar to this was observed in the Mexicans in the United States examined by the draft board. Whereas, these people were not classified according to race by the draft board, there were recruiting stations that examined men who were practically all Mexican Indians. These draft board examinations showed very few developmental defects in the teeth, but a high incidence of gingivitis.

It is very possible that gingivitis may result from deficiencies in diet, as asserted by Black; but the exact deficiencies or excesses in the diet responsible for this condition are not very well known.

Gingivitis may aid development of gingival caries. Although the saliva is neutral, the deposits on the teeth may prevent the saliva from reaching the teeth, and acid conditions may develop under these deposits and cause dissolution of the teeth. This is well illustrated by the fact that, although sea water is slightly alkaline and is supersaturated with calcium carbonate (calcite), a slab of polished marble (calcite) immersed in sterile sea water will not dissolve in any length of time; but if marine organisms are allowed to attach to it and grow on it, the marble is dissolved underneath these attachments.

It is possible that a lack of calcium in the diet may produce an osteoporosis of the bones, and in addition, a similar process in the teeth. Some observations tend to indicate that in osteoporosis we may have not only an enlargement of the marrow cavity but also an enlargement of the canals in the bone, both Haversian canals and canaliculi. It is possible that an enlargement of the canaliculi in the dentin occurs, and such a condition would lead to a more rapid progress of caries in the dentin.

We should, therefore, take care to have sufficient calcium in the diet. The only adequate general source of calcium in the food is milk. The Chinese obtain calcium largely from vegetables, but all of us cannot eat the Chinese diet. The Chinese have been unsuccessful in raising cattle owing to contagious diseases among them. Our ancestors on the plains of Asia raised cattle, and we should continue to raise cattle and drink the milk.

CYSTS AND TUMORS IN THE ORAL CAVITY

By CHALMERS J. LYONS, D.D.Sc., Ann Arbor, Michigan

(Read at the dedication of the Deaner Institute, Kansas City, Missouri, May 23, 1924)

IF DENTISTRY is to assume and maintain its position in the great problems of health that it has suddenly had thrust on it, a wider study must be made of the oral cavity in its relation to health and disease.

When we think of the constant irritation that is occurring in this region through traumatism from erupting teeth, from smoking, from lack of dentistry, and also from poor dentistry with resultant infection, we marvel that Nature is so kind as to prevent more disastrous results than those which actually occur. The tissues of the mouth and jaws do not differ materially from the tissues in other parts of the body so far as neoplasms are concerned. Nearly all of the cysts and tumors that occur in any part of the body may be found in the oral cavity. It is to some of these lesions that I wish to direct your attention at this time.

The most common types of cyst formation found in the oral cavity are the radicular cysts, the dentigerous cysts and the ranulae or retention cysts. Then, occasionally, in the lips or cheeks, are to be found the mucoid cysts, arising from the mucous glands. These, too, are forms of retention cysts. All of the cysts occurring in the oral cavity develop, unfortunately, without pain, and frequently assume large proportions, with a resultant tremendous destruction of normal tissue without inconvenience or knowledge of the patient.

The most common type of cyst found in the oral cavity is that termed the radicular cyst, sometimes referred to as the simple cyst (Fig. 1). These cysts, which are nearly always associated with a devitalized tooth or tooth root, are frequently found in edentulous jaws after such a tooth or tooth root has been extracted.

The etiology of the radicular cyst is not clearly established. It undoubtedly has its beginning in the granulomas or pericementomas. It is not clear just why some of these granulomas develop into cysts while others do not. It is a clinical fact, however, that certain of the granulomas increase in size until a cavity in the bone is formed which is lined with epithelium. The contents of the granulomas undergo decomposition, and a fluid content remains, which gradually increases, and the bone surrounding the cyst undergoes resorption. There are several theories advanced as to the origin of the epithelial lining. Most investigators believe that it develops from a periodontal epithelial remnant.

The rapidity of the growth of these cysts is influenced in a measure by the nature of the surrounding osseous tissue. The growth in the maxillae is more rapid than in the mandible and the

cysts have a tendency to greater growth in the maxillae without inconvenience to the patient. In fact, they may develop until there is a great destruction of osseous tissue without their presence being known to the patient. When these cysts develop in the molar or premolar region, they may invaginate the contiguous walls of the maxillary sinus and completely obliterate this cavity. Such a condition is not infrequent in the larger cysts in the maxillae.

In the mandible, the growth is slower on account of a denser osseous structure.

Fig. 1.—Radicular or simple cyst.

Here, they may develop until a vast area is destroyed, involving several teeth. I have seen several cases in which the whole of the coronoid process was destroyed without any perceptible inconvenience to the patient.

"The development of these cysts is invariably chronic and of a slowly progressive nature. As a rule, no disturbing signs or symptoms arise until they become infected or some important structure is pressed upon,"[1] or until they become so large that a change in the facial contour is noticed. By this time, a large amount of tissue has been destroyed; the outer plate of bone has been resorbed by the pressure of the increasing cystic fluid until, on, palpation it conveys the sensation of palpating parchment, or a sensation simulating crepitus. Occasionally, these cysts may become infected either by rupturing into the oral cavity or by surgical interference through an error in the diagnosis; the surgeon assuming the cyst to be an abscess and opening it for the purpose of establishing drainage. In such cases, there may be symptoms of infection, and pain may be associated with the lesion. The cystic fluid will vary in color from a light amber to a dark brown, depending on the length of time the cyst has been in the process of development, and on whether or not infection is present. The aspiration of this fluid is a pronounced diagnostic feature in making a differential diagnosis. The roentgen ray also will reveal a clear-cut circumscribed cavity, with a very definite limiting wall.

1. Berger: Text Book on Principles and Technic of Oral Surgery, Brooklyn, Dental Items of Interest Publishing Co., 1923.

Treatment

There are several methods of treatment of these cysts. It is obvious that the treatment must be surgical. Some operators prefer the Partsch operation of removing the outer wall, leaving the cystic lining intact and suturing the mucoperiostium to it. The cystic membrane subsequently undergoes a change that simulates the oral mucosa. The objection to this operation is the postoperative depression of the parts involved, there being little opportunity for bone regeneration. The operative procedure that has been most successful in my hands consists in, first, incising mucoperiostium, then elevating it in order to expose the osseous structures involved. Then the outer plate of bone is removed and the cyst sac is completely enucleated. The edges of the outer wall of the involved bone are

rounded over, and the cavity is packed with iodoform gauze for forty-eight hours. At the end of this time, the dressing is removed and the cavity is repacked, a smaller dressing being employed. This is repeated every forty-eight hours, until granulation takes place from the bottom of the cavity. We prefer such operative procedure for the reason that quite extensive osteogenesis will follow, and a more nearly normal condition will eventually be reestablished.

The Follicular or Dentigerous Cyst

What has been said relative to the radicular cyst applies equally well to the follicular or dentigerous cyst, except as to the etiology.

Dorance[2] finds that dentigerous cysts are not so common as radicular cysts, the ratio being about 1:4.

Follicular or dentigerous cysts develop from the enamel sac which surrounds an unerupted tooth, and which takes on a hypertrophy and proliferation at the time the tooth should erupt. Consequently, these cysts develop about the time of the normal eruption of the teeth. The most common ages at which these cysts occur are from 9 to 20 years, just at the time when the teeth are in the process of eruption. Occasionally, we find one of these cysts developing later in life, but undoubtedly, if we had the complete history of the case, the incipiency would date back to the normal time of eruption of the tooth.

The teeth that are most commonly involved in the dentigerous cysts are the cuspid and the third molar. These two teeth are more prone to impactions than any other teeth and are also more frequently unerupted.

All of the clinical features of these cysts are similar to those of the radicular cyst. They are less likely to be infected unless an external communication is created.

The treatment is identically the same as the treatment for the radicular cyst. The tooth that originates the cyst is usually malformed and attached to the cystic membrane. It is easily removed with the enucleation of that tissue. The postoperative treatment is the same as outlined above for the radicular cyst.

Ranulae

The next type of cyst which we will consider is a form of the retention cyst and is sometimes spoken of as a ranula. These are found in the floor of the oral cavity in either side of the midline. As to the origin of these cysts, there is a wide diversity of opinion. It has been thought by some that they are caused by an obstruction of Wharton's duct. However, in practically every case of ranula, this duct has been found open and free. If this duct were obstructed, there would be inflammatory symptoms that do not occur in the presence of ranula. In fact, the ranula develops similarly to other cysts about the body without untoward symptoms until some important structures are pressed on.

It has been thought by some observers that the ranula is a degenerated sublingual bursa. Others believe it to originate from a congenital defect. Blair[3] believes that the anatomic relation and histologic structures of these cysts limit the site of origin to one of the following structures: the incisive glands of Susanne and Merkel, the sublingual salivary glands or one of Bochdalek's glands. A ranula is usually unilateral and unilocular. It is a chronic swelling that de-

2. Dorance, G. M.: Etiology, Pathology and Treatment of Cysts of the Jaws, Dent. Summary, Vol. 42, 1922.

3. Blair, V. P.: Surgery and Diseases of the Mouth and Jaws, St. Louis, C. V. Mosby Co., 1913.

velops very slowly without pain in the anterior portion of the floor of the mouth. It is bluish gray and often covered with veins, which seem to be lying close to the surface. It frequently ruptures without surgical interference, but usually recurs when the broken tissues repair.

Treatment

When these cysts are discovered early, they may disappear after the cavity has been freely opened and swabbed with phenol or tincture of iodin. Some operators use a seton of silk or a silver wire loop, passed through the cyst for the purpose of establishing drainage. Others use a hollow ring with openings drilled in it, which is passed through one wall of the cyst, for the same purpose. All of these methods in my hands have met with indifferent results.

Fig. 2.—Composite odontoma

The treatment which has been successful with us is essentially the same as the treatment for cysts in any other part of the body; that is, the enucleation of the cystic membrane with its contents. The tissues are infiltrated with a local anesthetic, care being taken to keep the point of the needle remote from the cyst. The mucous membrane overlying the cyst is carefully incised without penetrating the cystic membrane. The cyst is then forced through the incision, care being taken not to rupture the cystic membrane. The whole body is then enucleated. Following this procedure, the mucous membrane is sutured to the walls of the cyst cavity. By this treatment, the process of repair is very rapid and conditions soon return to normal.

Tumors

Mills,[4] an English surgeon, presents a definition for tumors that we believe emphatically expresses the character and nature of these new growths about the human body. He says a tumor is a new growth of tissue or cells arising without known cause and continuing to grow on its own account without regard to the growth or nourishment of the individual in which it is forming. It serves no useful purpose and comes to no physiologic termination.

Fig. 3.—Composite odontoma (Fig. 2) after removal.

The first of the tumors that we shall discuss will be those of dental origin. The odontoma is the most pronounced tumor arising from the dental tissues. These tumors are classified as follicular odontoma, and composite odontoma. The follicular odontoma has already been described under the term of dentigerous cyst.

The composite odontoma (Figs. 2 and 3) is a hard tumor composed of the

4. Mills, G. P., and Humphreys, Humphrey: Textbook of Surgery for Dental Students, New York, Longmans, Green & Co., 1913.

structures that enter into the formation of a tooth; that is, the tumor presents a disorderly conglomeration of cementum,

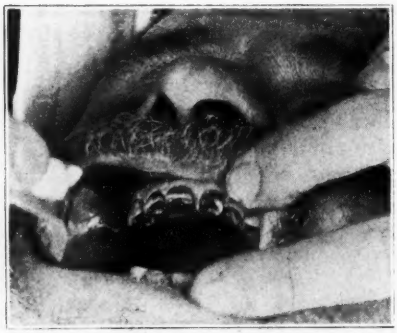

Fig. 4.—Epulis.

dentin and enamel in varying proportions. Frequently, a well-formed tooth or several well-formed teeth may be found in the tumor mass. In other instances, irregularly shaped masses of enamel and dentin make up the tumor. These tumors are benign, and after they are once formed, it is doubtful whether the growth continues. They form in youth, and the development occurs synchronously with that of the teeth. They may be found in both the maxillae and the mandible. There are no symptoms connected with the developing odontomas. Sometimes, these tumors interfere with the normal eruption of the teeth and subsequent development of the jaws. The treatment consists in the complete removal of the dental mass by removing the outer plate of bone and dissecting around the tumor until it becomes loosened and, then lifting it out intact. Occasionally, small spurs will push out into the bone, like fingers. These may be fractured off in an attempt to remove the tumor. When this occurs, these fingers should be removed. Packing the crypt after the removal with iodoform gauze and changing the dressing every forty-eight hours will permit granulation to begin at the bottom of the cavity, and repair will take place.

The next lesions we shall consider are those tumors of nondental origin or those that arise from the alveolar process and periosteum. The most common tumor of the mouth with which the dentist comes in contact is one of this origin. It

Fig. 5.—Oral tumor, treatment of which was delayed.

is commonly called epulis (Fig. 4). This tumor arises from the alveolar border and, as its name implies, it is a growth on the gum. It usually is of slow growth and, as Bloodgood says, the epulis stands between the really benign, slightly malignant, and the malignant connective tissue tumors. These tumors occur most frequently in children and in young adults. They are more often present in

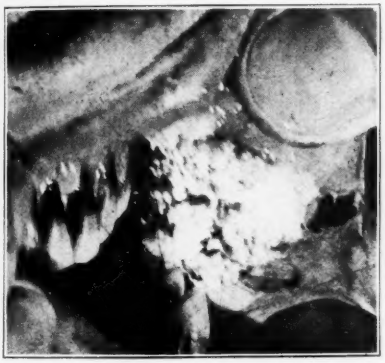

Fig. 6.—Condyloma.

the female than in the male. In a series of 167 cases, Scudder[5] reports forty-nine in man and 118 in women. Thus, it would seem that women are more susceptible to this type of tumor than men. Pregnancy seems to favor the growth of these tumors in the oral cavity.

These tumors frequently start from an old tooth socket in which a portion of a root has been left. They may arise through an irritation to the periosteum as a result of the deposition of serumal calculus. Calculus deposits on the teeth may also be looked on as a possible etiologic factor. There are two varieties: the fibrous epulis and the giant-cell or sarcomatous epulis. The latter is the more common and more nearly approaches malignancy. The fibrous epulis is ordinarily of small size, projecting between two teeth and spreading somewhat over the alveolar border. This type may become calcified extensively or in limited areas throughout its substance. I have seen cases in which the whole stock was entirely calcified. This variety is smooth and quite firm on the surface. It is not very vascular and does not bleed very easily.[6] The other variety,

Fig. 7.—Maxilla of baby, aged 10 months, with melanotic sarcoma.

the giant-cell or sarcomatous epulis, presents an opposite picture. It forms a soft, red, irregular rounded mass, seen on the border of the gums, either external or internal to the teeth. The growth contains many blood vessels and bleeds easily when disturbed. Both varieties of the epulis develop without pain and sometimes attain great proportions before the patient presents for treatment. They grow slowly at first, but as the tumor progresses, the growth is more rapid.

Treatment

The importance of the early treatment of these oral tumors cannot be overestimated (Fig. 5). As soon as identified they should be removed and subjected to a careful microscopic examination (Fig. 6).

5. Scudder, C. L.: Tumors of the Jaw, Philadelphia, W. B. Saunders Co., 1915.

6. Lyons, C. J.: Some Pathological Conditions of the Mouth and Their Treatment, New York M. J., 109:191 (Feb. 1) 1919.

The cure consists of complete eradication. Unless the base of these tumors is destroyed, they will return; and each time they recur, the growth will be more rapid and they will have a tendency to become more malignant. I have seen one of these tumors fill the whole mouth with new growth in six weeks following the cutting off of its top without destroying its base.

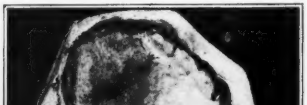

Fig. 8.—Model of maxilla of baby, aged 10 months, showing melanotic sarcoma.

The treatment consists in removal of the whole tumor with its base, followed by the use of the actual cautery over the whole surface. There is a greater tendency to do an insufficient amount of cutting than there is to perform an operation that is too radical.

The malignant tumors of the jaws will be briefly considered next in this discussion. They are the sarcoma and the carcinoma. Sarcoma[7] is a general term given to nonencapsulated tumors of any of the connective tissues, fibrous tissues, bones, etc., which tend to infiltrate neighboring tissues and to spread to distant parts through the blood stream. Blair points out that the habit of invading neighboring and distant tissues consti-

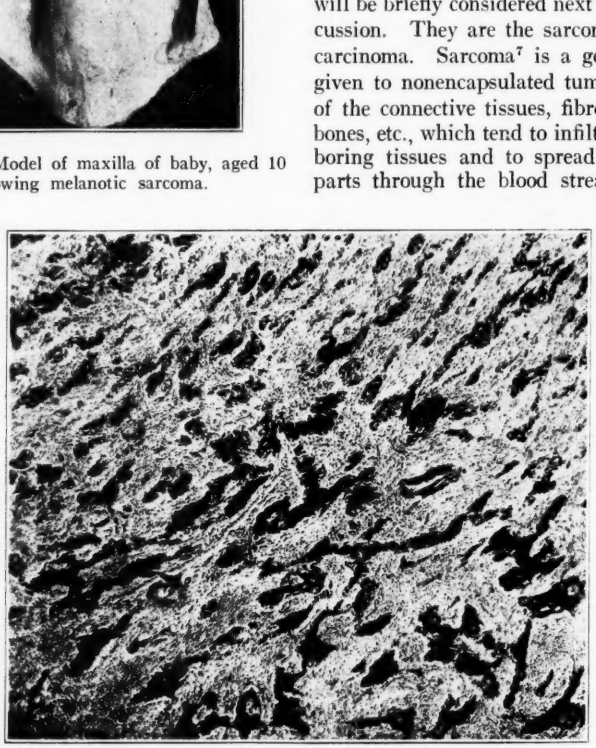

Fig. 9.—Microscopic section of tumor showing melanotic areas.

7. Brown, G. V. I.: Surgery of Oral Diseases and Malformations. Philadelphia, Lea & Febiger, 1912.

tutes malignancy. These tumors may arise from the gums, the antrum or the periosteum; or from within the alveoli of the bone. There are many varieties of the sarcomas found in the oral cavity. They may be of the spindle, large or small round-cell variety. The microscopic examination of them, following their removal, will usually identify them and give some information as to their virulency. The large round cell is less malignant than the small round cell. The greater the proportions of fibrous tissues in these tumors, the less the malignancy. In the maxillae, the periosteal sarcoma may arise within the bone and cause a bulging of the outer plate. They usually form without pain and are sometimes well advanced before the patient applies for treatment. Sarcomas of the jaws occur at any time in life. They frequently occur at a very early age. I recently operated on a melanotic sarcoma in the maxillae of a baby 10 months of age. This type of sarcoma is considered the most malignant of all the sarcomas (Figs. 7, 8 and 9).

In some types, the growth is very slow taking years to become perceptible; while in others they reach a tremendous size within a few months. The more rapid the growth, the greater the tendency to malignancy.

The prognosis in all cases of sarcoma is not favorable unless operation is performed very early. The treatment consists in a radical excision of all of the involved tissues well into the healthy structures. A microscopic examination of the tumor should be made in every case to determine the variety and virulency of it. This should be followed by deep roentgen-ray or radium therapy. The exact status of this treatment is still problematic, but it is the best we have at the present time.

The other malignant tumor that occurs all too frequently in the oral cavity is the carcinoma. This lesion rarely appears before 40 years of age, and is invariably found in unclean mouths. It is a tumor arising from and composed of epithelial tissues. The prognosis of carcinoma of the jaws is not good. Usually, it has progressed to an extensive involvement before the patient is aware of it, and metastasis through the lymphatics occurs early in its development. Carcinoma has its origin in some form of irritation.[8] It occurs more frequently in men than in women. The irritation from the excessive use of tobacco, either smoking or chewing, predisposes to carcinoma. Syphilis is also a predisposing factor. Jonathan Hutchinson states that 40 per cent of carcinomas of the jaws can be traced to syphilitic lesions. Irritation from ill-fitting dentures, roughened, broken-down tooth roots, sharp edges of teeth, trauma, etc., in patients over 40 should be looked on by the dentist with considerable concern, as they may be a source from which carcinoma may easily spring.

Fig. 10.—Inoperable carcinoma.

Scudder has given the following very complete outline to facilitate the diagnosis of tumors of the oral cavity.

The surgeon should consider the his-

8. Brophy, T. W.: Oral Surgery, Philadelphia, P. Blakiston's Son & Co., 1915.

tory of the tumor; its exact time of appearing; its precise location at the beginning; its size when first detected, the rate of its growth; the jaw involved; the possibility of trauma; the condition of the teeth in early and adult life; associated conditions of pain, discomfort, and deformity; as well as the presence of glandular enlargement, metastatic growth, cachexia, syphilis and tuberculosis.

When we consider the invariable outcome of a malignant tumor of the mouth when not treated, with its attendant horrors, not only to the victim but also to his family; when we consider the improbability of successfully treating these cases in the advanced stages (Fig. 10), we can clearly conceive the advantage and importance of making an early diagnosis. The dentist usually sees these malignant diseases of the oral cavity before the surgeon sees them, because the average patient does not present himself to the physician until physical discomfort compels him to seek aid. By this time, it may be too late. The disease may have progressed so far that it is inoperable or the probability of successful treatment is greatly reduced.

In many cases, the dentist has the opportunity to observe and direct them early. Blair places the responsibility of early diagnosis of malignant diseases of the oral cavity squarely upon the dentist. In a classic statement, he says, "Until the much desired cancer specific is discovered, it is mainly to the educated dentist, who is grounded in general and oral pathology, who makes a complete survey of the whole mouth, that the medical profession and the public must look to reduce the now increasing death rate from cancer of the mouth."

It is appalling to see the great number of persons with inoperable carcinomas of the oral cavity who come to our large hospital clinics all over this country whose lives might have been saved had an early diagnosis of their condition been made. Many of these patients have at some period in the growth of the tumor been examined by the dentist, some by the physician; and both have ignored the serious consequences of a "watchful waiting" procedure.

The surgeon should make a careful examination of the growth to determine its physical characteristics. If an accurate history of the case is obtained and a thorough examination of all of the structures involved is made, they will go far in helping to formulate a sane and judicial diagnosis, without which our treatment not only may be futile but may also give impetus to the disease and prove disastrous to the patient.

A FURTHER DISCUSSION OF SOME PROBLEMS IN DENTAL EDUCATION*

By WILLIAM J. GIES, F.A.C.D., New York City

(Read before the American Association of Dental Schools, Chicago, Illinois, March 5-7, 1924)

IN an extemporaneous introduction, I stated that my opinions were presented very directly for the sake of brevity and clarity, not with assurance of their finality; and that correction of error as well as criticism of conclusions was cordially invited. I alluded to the well-known conditions attending the initiation, in 1921, of the Carnegie Foundation's study of dental education; to the general scope and mode of conduct of the study, and to my indebtedness to the officers of all the dental schools in the United States and Canada for their cordial cooperation throughout its progress. In order to correct some erroneous current opinions regarding the public relationships and responsibilities of the Foundation, various items were read from the published annual report of the president of the Carnegie Corporation for 1923.

I stated that my paper was intended to direct attention to general principles and that my views rested on the broad conclusions (*a*) that dentistry is and may suitably remain an independent division of health-service; (*b*) that it should be made equivalent in serviceability to an oral specialty of medicine; and (*c*) that it should be improved accordingly. I felt that the suggested improvements should be tested voluntarily, if at all, by the schools best qualified to do so.

After finishing the presentation of the paper, I expressed appreciation of the opportunity to read it to the Association, and again requested the members to discuss it freely, frankly and critically, and thus to favor me with further assistance in the formulation of correct conclusions, for the report on dental education to be issued in the near future by the Carnegie Foundation. I stated that, in order to avoid all possibility of controversy, I would not reply to criticism; and I hoped that this assurance that criticism could not occasion unpleasantness would facilitate expression of direct dissent on every item on which it might suitably be recorded.

Dentistry has been traditionally a means of repairing and perfecting the mechanism of mastication, inducing oral comfort, correcting maxillary and palatal deformities, maintaining normal vocal enunciation and retaining or restoring facial comeliness. Dentistry has also

*Previous discussion: Gies, W. J.: Dental Educational Problem, J.A.D.A., 11:97-108 (Feb.) 1924.

*From the Carnegie Foundation for the Advancement of Teaching, New York City.

become, and is now primarily, oral health service.[1]

Dentistry is one of the most varied, useful and responsible divisions of health-service. Exceptional difficulties attend its successful practice. These exactions are due to concurrent medical, mechanical and esthetic demands on it.

Considered as a whole, the practice of dentistry is, in effect, a combination of medicine and mechanics, largely on the basis of fine art, applied to the teeth and mouth directly. Oral health-service, with correlative systemic health-service, is the fundamental purpose of the practice of dentistry. Mechanical procedures are its chief ways and means. Artistic oral restorations and reconstructions are its esthetic achievements.

Medicine, mechanics and art constitute the tripod on which the whole of modern dentistry rests. Pull away one of the three legs of that tripod, and dentistry ceases to be itself.

The dental profession should welcome every earnest effort to advance the usefulness of dentistry and to improve its status. Current tendencies to deride or abuse the dental schools that test their convictions, at their own expense, for the information of the schools as a group, imply not only a low order of educational understanding but also a woeful lack of the spirit of progress.

Antagonism between medicine and dentistry cannot be explained on any basis of public interest or advantage, and has no justification whatever in any sentiments that are worthy of respect. Both professions are agencies for health service and cannot perform that service faithfully on any other relationship than one of earnest and effective cooperation.

Dentistry is neither a political party nor a secret society. It is not an organization of dentists, conducted by dentists, for dentists. Dentistry is an accredited agency for public service, open to public inspection, subject to public regulation, and subservient to enlightened public opinion.

The same statement applies, of course, with equal pertinence and force, to the Carnegie Foundation, the Rockefeller Foundation, the General Education Board and all similar agencies for the promotion of the public welfare.

Dentistry in this country, and in Canada, is based upon an independent system of education, and is regulated by a special law in each of the states or provinces.

The independence of dentistry has developed spontaneously. Continuance of that independence is, therefore, a natural expectation, which cannot conflict with public interests so long as dentistry maintains normal efficiency and promotes the continuous growth of oral health service. These are merely statements of the obvious.

The unusual refinements of its manual procedures make dentistry an independent division of health service. With the exception of maxillofacial surgery and major oral surgery, which are on the border line, dentistry cannot be regarded as a specialty of medicine in the sense

1. Throughout this statement, "health service" is used to signify any or all types of service, whether educational or direct, for the maintenance or promotion of health, for the restoration of health or for the prevention or alleviation of the distress of ill health. Medicine and dentistry are regarded as coordinate divisions of health service, in harmony with the facts of their accredited independence. "Medicine" is used in its various conventional senses, and in every instance includes surgery. In some cases, surgery is plainly the primary suggestion when medicine is used. "Mechanics" and "mechanical" are used in their ordinary senses, as they are understood in mechanical engineering. Many medical procedures are mechanical; but when "medicine" and "mechanics" are used differentially, I refer primarily to the distinguishing features of each.

that the practice of dentistry depends, or should depend, on acquisition of the present training for the degree of M.D.

Dentistry as a profession is avowedly a public servant. It has no obligations of any kind whatever that, individually or collectively, are equal to its duty to promote the public welfare. Every problem in dental education, therefore, is inherently a social problem.

Oral health service has become increasingly valuable as its beneficence has become better understood, and as its procedures have been improved. The medical import of oral health service has been growing steadily in public appreciation.

Dentistry is fully equal in health serviceability to such specialties of the practice of medicine as laryngology, rhinology, ophthalmology and dermatology. It is not inferior to any of them in utility, importance or responsibility.

The need for oral health service is taxing the present capacity of dentistry to render the full quality of the service required. More quality and correspondingly less quantity of dental service is strongly indicated. Greater success in prevention (quality) would reduce the need for artificial restoration (quantity). Poor dentistry may be worse for a patient than none.

Many mechanical phases of dentistry are now practised on a basis that is very largely empiric and in ways that are freely productive of pathologic consequences. Narrowness of education accounts for this superficiality. Scientific biologic knowledge and sound application of mechanical principles in dentistry are demanded by every consideration of faithful professional service. Such knowledge and such practice cannot be attained by men whose minds have not been prepared by suitable education to achieve them. Exceptions prove the rule.

General realization, during recent years, that dentistry has become equal in importance in health service to a specialty of medicine, has brought dentistry face to face with a dilemma. Dentistry will grow in its own field to be as competent as a specialty of medicine to render health service, or it will not. The choice is entirely within the present option of dentistry.

If dentistry becomes, as it should and as we hope, fully equivalent in service value to an oral specialty of medicine, dentistry will deservedly continue to hold its independent place in public confidence.

If, however, dentistry will not or cannot grow into the efficiency of the equivalent of an oral specialty of medicine, public interest will require creation of an accredited specialty of medicine to render oral health service and will no longer look to dentistry for it.

If dentistry fails to accept her present opportunity to become the equivalent of an oral specialty of medicine; and if, in that event, medicine, responsive to public needs, should create the specialty of stomatology; then, dentistry obviously and of necessity would be restricted to performance of the function of technical assistant to that specialty of medicine.

"Public interest" and "public needs" in this relation would be determined by a consensus of enlightened public opinion. in the formation of which the judgment of teachers in the leading schools of dentistry, of agencies for public health service, of the medical profession, of experienced students of the biologic sciences and of well-informed laymen, would be highly influential. Dentistry owes it to her sense of public duty, and to her professional self-respect, to rise to the full height of her present opportunity in oral health service; and to continue to add to her triumphs in oral surgery and mechanics, and in dental art as well.

Dental education is now passing ac-

tively through an important transitional period. It is proceeding from a high school basis to an academic college foundation. Whether early efforts further to improve the status of dental education would be timely, while this transformation is in progress, must obviously depend on the urgency of public needs in oral health service, on dentistry's immediate capacity fully to meet that requirement and on the degree of present opportunity to make dental education a better means for the attainment of its public purposes.

On a former occasion (Cleveland, 1923),* I drew attention to a field of health service which neither medicine nor dentistry has occupied, but which, it was suggested, should be included in dentistry and dentistry enlarged accordingly. It was urged that dentists as a body should be trained to give systemic health service, and to become not only dental surgeons and oral engineers but also oral physicians and oral sanitarians.

On that occasion, dentistry was defined as the learned profession that is devoted (a) to establishment of the principles, and to application of all forms of scientific health service relating directly to the teeth and adjacent oral parts, and also relating indirectly, through such service, to the welfare of other parts of the body and of the body in general. It was said that dentistry also includes (b) establishment of the principles of correlation between dental and oral conditions and systemic diseases, with particular reference to effects of the latter on the welfare of the teeth and adjacent oral parts. It includes the detection and provisional diagnosis of dental and oral symptoms that indicate or imply the prevalence of ill-health elsewhere in the body. It includes advisory health service for the patient based upon such a diagnosis.

Dentistry is like a specialty of medicine; should have the quality of a specialty of medicine, and, in effect and in the view of laymen, is such a specialty.

Medical schools in this country have ignored instruction in oral health service, apparently on the assumption that such service is wholly the function of dentistry.

Public interest requires that any physicians or surgeons who may not have been trained to give oral health service, and who therefore cannot practise it, should refrain from meddling with such service and from obstructing its development in dentistry.

Dentists should be trained to give not only oral health service but also general advisory health service dependent on oral diagnosis. Dentists should welcome an opportunity thus to enlarge their service.

The frequency with which dentists are, and will be, consulted for oral health service gives to dentists a particular opportunity to note not only the occurrence of oral and systemic diseases but also the existence of correlations between systemic and oral disorders, and to help or to guide patients accordingly.

Although it may suitably be conducted independently, dental education should be closely coordinated with medical education.

Dentistry will not be able to meet the full requirements of modern oral health service until dentistry attains the educational equality of medicine. Educational quality does not require educational identity.

Intellectual, social and service equality with medicine cannot be attained by dentistry unless predental education is made equal in academic quality to premedical education.

Dentistry cannot become the equivalent of an oral specialty of medicine, and

dental education cannot be effectively coordinated with medical education, unless the minimum academic requirements for admission to medical and dental schools are equalized in general.

Medical education in this country has been based universally, since 1918, on an entrance requirement of at least two years of work in an academic college, following completion of the work of a four-year high school. Premedical education appears to have become stabilized on that minimum. All of the reasons for the adoption and retention by medicine of this premedical requirement, after a four-year trial or a requirement of one year of work in an academic college, apply with equal force to early adoption of the two-year requirement by the oral division of health service. There is an additional reason: medicine, having tried the two-year requirement, retains it because it has been found to be essential for all classes of practitioners of the healing art. If that preliminary educational requirement is essential for a laryngologist, a rhinologist, a dermatologist or an ophthalmologist, why not for a dentist?

The curriculums of premedical and predental education could be and should be combined. The many prospective advantages from such a consolidation are self-evident. The proposed adjustment could be accomplished at conferences of representatives of the universities concerned. It could be attained without impairment of the high educational quality a college curriculum should have. The combined curriculums could be given a suitable range of adaptability to the diverse practical needs of prospective internists, surgeons and dentists, through the agency of a reasonable proportion of desirable elective courses. Early association of prospective physicians, surgeons and dental surgeons, on a plane of educational equality, would be socially and professionally desirable for each group. The work in the academic colleges might be increased without detriment to the students.

A few elective courses, in a joint premedical and predental curriculum, that would arouse, develop and refine the mechanical ingenuity and the digital facility of prospective dentists, would prepare the basis, or reveal ineptitude, for dental technology, just as such required preliminary courses, in the same curriculum as those in biology and chemistry would develop the foundation for the medical aspects of oral health service.

Some or all of the proposed electives could be taken at summer sessions during the predental period.

After two years of such predental study in an accredited academic college, a student not only would have the lifelong advantages of that advanced preliminary education, but also would be more mature, and manually, mentally and morally more competent to proceed in a dental school than he could have been two years earlier immediately after graduation from a high school. He would also be proficient in all of the academic subjects, and some of the technical, now included in the dental curriculum, from which, on this plan, they could be properly eliminated.

Capacity for high-minded leadership, and ability for research and constructive thinking, very important qualities in a professional man, are stimulated and improved in the academic colleges.

Dental education is a function of universities. The most favorable educational conditions for instruction in dentistry are plainly those provided in universities by cordial cooperation between the teachers of dentistry and those of the schools of medicine and engineering. Such cooperation insures the most effective teaching under the most advantageous circumstances for all concerned.

The medical and mechanical sciences

should be taught to all types of students, in a university, in the centralized laboratories for each of these sciences.

The medicodental courses in the dental curriculum should be taught to dental students separately. The teachers of the medicodental subjects should be members of the dental faculty, or subject to its jurisdiction in the instruction of dental students, and, in general, should be graduates in dentistry whenever dentists with adequate training and scholarly capacity in these subjects are available. At present, very few dentists are qualified for such service. The medicodental courses should be adapted to the special needs of dental students, by suitable reorganization, concentration, coordination and clinical application, and with proper emphasis on oral phases of the subject, without any impairment of the intellectual quality of the medicodental instruction as contrasted with medical standards, but with full efficiency for the development of general medical comprehension of, general medical outlook on and special medical applications to, the problems of oral health service.

The courses in a given subject for medical and dental students need not be identical to be equal in power to impart medical understanding, medical judgment and capacity for growth in medical wisdom.

Certain fundamental mechanicodental subjects in the engineering curriculum should be taught to dental students by members of the dental faculty or by engineering teachers under the jurisdiction of the dental faculty. In this relation, as in the medicodental, the teachers should be, in general, graduates of dentistry wherever dentists as competent as engineers in these subjects are available. A relatively large number of dentists have acquired that ability. The courses in these subjects, like those in the medicodental, should be adapted to the particular needs of the dental students, without impairment of the practical quality of this instruction as compared with engineering standards, but with full efficiency for the development of comprehension of the mechanical conditions and principles of dental architectonics in accord with the specific requirements of oral health service.

In the organization of a university department that gives instruction to more than one group of students, as in the case of a department that teaches only one group, the size and quality of the staff of teachers should be so adjusted to its teaching obligations that all requirements could be met without overloading any one with routine duties.

On a basis of broader predental education, better medicodental understanding and improved mechanicodental facility, the courses in oral technology and in clinical dentistry could be developed to their highest degrees of efficiency, because all the principles involved would be better comprehended by the student and the work would be more scientific and less empiric.

On this plan, a student would derive higher intellectual qualifications from the well directed preprofessional education. The dental curriculum would be abbreviated by the elimination of academic subjects. There would be better adaptation and coordination of the whole undergraduate curriculum. Desirable condensation of that curriculum would be attainable, therefore, despite inevitable additions.

Under the favorable circumstances outlined above, on the basis of two years of predental study in an academic college, including suitable elective subjects as suggested, earnest and diligent students could be taught the fundamentals of dentistry so successfully that such students might properly be graduated at

the end of three years of intensive dental study, as competent safely and acceptably to begin the general practice of their profession and to grow steadily in proficiency.

If this could not be accomplished in three years of eight months each, it could be done in three years of nine or ten months each. Why should academic vacations be four months in length, particularly for students of an art that requires sustained effort and continuous training in its special neuromuscular coordinations, for attainment and retention of the necessary dexterity in its refinements.

The undergraduate dental curriculum should be planned primarily to afford effective training for the general practitioner of dentistry. The dental courses should be equal in quality to the medical courses in the corresponding subjects and, as far as possible, interchangeable in academic values.

A graduate of such a three-year dental curriculum would have a better training than that now given by most dental schools. He would be intellectually and professionally the equal of the general practitioner of medicine. He would use the means of mechanics, think the thoughts of medicine and speak the language of health service.

A three-year course for prospective general practitioners of dentistry could be made a satisfactory basis for systematic graduate curriculums, which are now very urgently needed for the development of oral specialists and for the recurrent further training of all types of practitioners.

A fourth-year curriculum, for a first graduate-year, could be added directly to the undergraduate curriculum, or to the undergraduate curriculum combined with other curriculums or modified throughout by electives, in the medical school and in other schools in the university.

The courses of such a first graduate-year could be begun the year after that of graduation from the three-year curriculum or later, as a student might prefer. Prospective specalists in dentistry could be given thorough and detailed training in such a fourth or first-graduate year.

A fifth-year curriculum, for a second graduate-year, could be similarly adjusted, very closely with the medical curriculum particularly, for the highest types of further specialization in oral science and art.

The prospective influence of such graduate work on teaching, research and professional leadership in dentistry is incalculable.

Combined curriculums, with medicine particularly, including hospital experience, should be provided for effective training in such fields as maxillofacial surgery, major oral surgery, orthodontia, medicodental research, public health service and dental education.

Practitioners could be given ample opportunity to take some or all of the courses of the first and second graduate years, either recurrently as special students or as regular candidates for graduate degrees. Courses for practitioners might suitably be confined to units in the graduate curriculum and to extension courses. Extension courses could be taken to practitioners, especially in outlying districts, with particular advantage. Superficiality should be discouraged, however; and certificates indicating the completion of individual courses should have no physical resemblance to diplomas.

Dental assistants, dental (oral) hygienists (nurses), and dental (oral) technicians—not "mechanical dentists"—could be trained in independent curriculums at any appropriate educational level, adapted to the needs of these or of

any new types of cooperators in the routine work of the dentist himself as the primary agent in all intraoral practice.

This general plan would be analogous, in gradation of academic values and in relationships of courses and advanced professional opportunities, to the programs of studies in universities that now lead to the award, respectively, of the degrees of B.S. or B.A., M.S. or M.A., and Ph.D. Adoption of this general plan could reasonably be expected to exercise similarly advantageous educational and professional influences in dentistry.

On this general program of studies, including the two-year predental curriculum, the degree of B.S. might be awarded at the end of the second dental year; D.D.S. or D.M.D. at the end of the third dental year; M.D.Sc. or M.S. at the end of the first graduate-year; and D.D.Sc. or Ph.D. at the end of the second graduate-year, according to the nature, extent and quality of the work accomplished.

From another point of view, the successive degrees might suitably be made B.S., B.D.S. or B.M.D., M.D.S. or M.M.D., and D.D.S. or D.M.D.

On combined medical and dental curriculums, the degrees might be such as to indicate general medical training with dental specialization.

The foregoing plan would involve nothing new in principle in a university. It would require complete reexamination and readjustment of ways and means in the conduct of dental education. This plan might be tested most effectively by dental schools in the leading universities. Probably, by 1930, it could be successfully evolved, modified or rejected, by them.

Dental schools that prefer to continue their work on a high school foundation might be able to perform a very useful function by changing the character of their instruction from that of a dental school to that of a school of dental technology. Schools of dental technology could effectively train dental assistants of the various types, or any new types, for the performance of extraoral service in cooperation with dentists.

Effective development of a large number of expert dental assistants of the various types would materially help many dentists to increase the degree of their personal intraoral health service.

Among the most urgent needs in the dental schools are better teaching and more fruitful research.

Special effort must be made to find, and to support the work of, men who would make teaching in dentistry their primary professional pursuit, and who would promote research effectively without interference with their work as teachers.

The placement of dental education on a basis of two predental years of study in an academic college would require better teaching in dentistry; but it would also help to develop better teachers and to stimulate the spirit of research, as in the case of medicine.

The development of the proposed graduate curriculums would increase markedly the number of available teachers of the greatest efficiency.

The practice of dentistry at its best, on a given patient, consists of earnest inquiry followed by specific action based on the implications from the findings. It is a form of research and should be conducted in the spirit of research.

A dental school should actively encourage research in each of its departments, not only to promote the extension of knowledge and to foster the spirit of research in the teachers, but also to develop, through the teaching, the spirit of inquiry in the students and future practitioners.

The teachers should not permit inter-

est in research to obscure the fact that their primary function is the training of students for the practice of their profession. This function is an important social opportunity and a high moral obligation.

Few teachers need more time for research than that commonly available for the purpose. Genius in research is notable for the ease with which it overcomes obstacles.

Capacity for exceptional research is uncommon. "Delusions of grandeur" in this relation are very common.

A dental school cannot grow into the highest degree of educational quality, nor into the greatest measure of professional serviceability, on a financial soil consisting solely of the fees paid by students and patients. On such limited financial resources, good teachers cannot be given adequate remuneration and fruitful research cannot be effectively promoted.

Dental education needs, deserves and should receive specific endowments for its promotion. It should enjoy a full share of all the advantages that now accrue to the students, teachers, investigators and practitioners of other types of health service. The universities owe it to the public, to dentistry and to themselves to make this situation perfectly clear to all concerned, so that the spirit of philanthropy may be induced to give to dental education the support and encouragement that the fullest growth and greatest perfection of oral health service require.

Whether the foregoing plan, for the general improvement of dental education, is practical and worthy of adoption, can best be determined directly by the universities concerned.

I suggest that a special committee of seven deans of university schools in this Association be appointed to invite all the universities concerned to sent representatives to a public conference (to be held shortly after the publication of the Carnegie Foundation's report on its study of dental education), to consider the status and possible improvement of dental education; and that that committee be instructed to submit a detailed report of the proceedings of the conference at the next annual meeting, or at a special meeting, of this Association.

The few remaining independent dental schools, all but two of which are members of this Association, are not included in this suggestion because they would have nothing of any educational importance to offer at such a conference. Their representatives could discuss and vote on the conference committee's report to this Association.

Should the Association prefer to remain inactive on this particular proposal, qualified frankly as it has been, independent action would be taken in conformity with the suggestion. Seven deans of university dental schools would be invited to cooperate in issuing a call for such a public conference of all the universities concerned. The deans would be requested to submit a detailed report to this Association, if the Association cared to receive it.

Discussion

Albert L. Midgley, Providence, R. I: In view of Dr. Gies' position in the study and survey of dental education that has been in progress during the past three years, I was especially impressed with his allusion to the tripod as symbolizing the basis on which dentistry rests—engineering, medicine and art. In the days of Apollo, the tripod was the seat from which the oracle was heard, and it is likely this allusion in relation to the foundation or basis of dental education has more than a passing significance in our present activities.

Dental education has gone forward rapidly during the past decade, happily on a sound, common sense basis, and we have every reason to believe that there shall be an active continuance of this progress. It appears that we have developed the technical side of our

teaching to a high degree, and it is equally apparent that the wider development of the medical mind and all it involves has not been given the serious attention in certain directions that it deserves. One of the aims of dental education is to develop digital skill, which implies the rapid and harmonious working of mind with hand; but in the attainment of this high degree of skill, we should not lose sight of the fact that it is essential to cultivate and train the intellectual and imaginative aspects of the mind. With the acquisition also of a broad intellectual and imaginative expansion, it must be admitted that a man can interpret more readily and accurately and can apply with greater facility the teachings of cardinal principles. This is the goal of professional education in dentistry as I view it. For, with a broader foundation in the academic and medicodental subjects, and with a continuation of our present methods for the mastery of technical skill, we shall graduate educated and trained men who have not only the power of handling ideas and principles but also the ability and skill effectively to apply their knowledge.

I believe we are proceeding at the present time on a rational basis in dental education and feel sure we shall overcome the difficulties that now confront us, if we have in mind at all times the necessity for wider development of the medical mind. At all times, let us have our minds open to possible advances in dental education, in its scope, its theory, its spirit and its methods. By all means, let us encourage and support those schools that are in a position to test this plan, for the results will be not only beneficial but also conclusive, provided the schools that try it are suitably equipped, under university control, with finances, competent organizations and capable well paid teaching staffs to make the experiment.

An average has been made of the grades given all Class A schools in the Council's classification issued under date of Sept. 15, 1923, on each item in the report form that was used in classification. This summary reveals very interesting data. While these deductions may be irrelevant to this discussion, in a sense they show quite plainly the caliber of the machinery at our disposal to make the test.

The report form presents ten groups, and ten points are allotted to each group. The numerical values of the items in each group are not uniform. On this basis, the general average of Group II is 66 per cent. Character of records, rules of promotion, grading, etc., is 74 per cent; faculty participation and cooperation, 71 per cent; university connection and all that it signifies, 68 per cent. If the proposed experiment is to stand the test, it is quite obvious there should be a marked improvement in this group unless those schools only, in the high range of the A classification, are selected to make the test.

Under Group III, the income for running expenses in excess of total from students' fees is 72 per cent; the salary scale adequate to secure and retain full-time men is 68 per cent. The general average of this group, so important in university control, is 72 per cent. In Group IV, the number of full-time teachers reaches 77 per cent, an outstanding weakness in our system at the present time; character of faculty including training, length of service, teaching experience, etc., is 77 per cent; professional activities, society work, books, research, etc., 75 per cent; faculty meetings, frequency, character, attendance, etc., 70 per cent. The average of Group IV, faculty and teaching staff, is 80 per cent.

The percentage of the student body having had preliminary education of college grade is only fair, 62.

The curriculum and course of study as to content is 89 per cent; order of presentation, arrangement and scope of subjects, 72 per cent; application of theory to practice, and proportion of science, technic and clinical work, 76 per cent; collateral aids, library, museum, textbooks, notebooks, etc., 69 per cent. The total of this group is 76 per cent.

In view of the statement frequently made and which is no doubt true, that the technical and clinical sides of dentistry have been widely developed, while the academic and medicodental subjects so essential in the education and training of a dentist have not been developed sufficiently, it is interesting to note that the group average of academic and medicodental subjects is 77 per cent, dental technology, 81 per cent and clinical dentistry, 79 per cent. The character of work in the academic and medicodental subjects is 73 per cent; the character of heads of departments, training of assistants, organization of departments, etc., 78 per cent. The character of the work in dental technology is 78 per cent; the character of heads of departments, training of assistants and organization of departments, 80 per cent. Operative features including all filling and prophylactic work, character of teaching, training heads of departments, etc., is 80 per cent; prosthetic features, including crown and bridge work, orthodontia, character of teaching, training of staff and heads of departments, 78 per cent; surgical and pathologic, including root-canal work, radiology, anesthesia, extracting and surgical clinics, character of teaching, training of staff and heads of departments, 74 per cent.

Statistics are not infallible; yet they have a significance and, with other information, prove

that there is room for wide improvement in many of the Class A schools.

Dr. Gies' proposed plan is very interesting, reflecting a profound knowledge of dental education, and if it is found acceptable after a rigid test, we should be forever indebted to him.

H. Edmund Friesell, Pittsburgh, Pa.: I have had an interesting opportunity to investigate the various schools in this country during the past three years in the company and under the leadership of Dr. Gies. Many interesting things have developed during those cordial and sometimes very strenuous relations. These investigations have been not only interesting, but also highly educational, in many ways, and not infrequently gave rise on my part to some speculation. Any presentation by Dr. Gies is always interesting and sometimes startling, but in none of the discussions, informal or prepared, in none of the articles that he has presented with regard to dental education during the past three years, has he made such a startling impression as in this latest effort. His paper is more or less revolutionary in character so far as my views of his gradual accumulative expressed opinions of dental education are concerned.

Dr. Gies' frequent repetition of the statement that dentistry is a combination of mechanics, medicine and art leads me to wonder if he realizes that the mechanical features of dentistry are so largely those of surgery. Dentistry I look on as more largely surgical in character than mechanical, for it is unquestionably true that its chief ways and means are surgical rather than mechanical. If I were attempting to erect a picture of dentistry supported by a tripod, surgery, mechanics and art would form the supporting pillars. Medicine might be included as a correlated subject. Probably Dr. Gies refers to medicine in its broadest sense as including surgery, but that part of medicine that concerns dentistry is so largely surgery that the latter term expresses the relationship much better.

Just here so many well meaning persons misjudge dentistry, and just here the mistake is made of believing that the dentist can be so largely aided by supplying him with a mechanical assistant, because much of the work in dentistry must be done by the dentist in the mouth of the patient, and it is the surgical application even of the otherwise mechanical principles which constitutes the vital step in that part of dental work.

The dental profession does welcome and has always welcomed any earnest effort to improve its status and advance its usefulness. For many years, it laid unaided the foundation of the study of dental education, without which the Carnegie Survey would have been extremely difficult, and the schools, the dental association, the boards and the members of the dental profession themselves have, in the past, paid for all of this investigation. There has never been manifested a tendency that I can recall to deride or abuse any school or group that desired to try out extreme things in dental education. Objection has been offered, and justly so, to the "inconsiderate reformer" in dental education who, not satisfied to try out his peculiar views, demands that everyone else be required to do likewise under the penalty of being pilloried as a "low-standard, unprogressive" educator.

Dr. Gies states that "Dentistry is an accredited agency for public service, open to public inspection, subject to public regulation, and subservient to enlightened public opinion." But who is best qualified to enlighten public opinion, if it isn't the group of men comprising the dental profession, whose lifework is devoted to this special field of health service? Dr. Gies says further: "Dentistry has no obligations of any kind whatever that, individually or collectively, are equal to its duty to promote the public welfare. Every problem in dental education, therefore, is inherently a social problem." Nothing in the history of dentistry would give reason to surmise that the dental profession ever thought otherwise about its obligations.

Dr. Gies admits that "The demand for oral health service is taxing the present capacity of dentistry to render the full quality of the service required," and then goes on to state: "More quality and less quantity of dental service is strongly indicated. Poor dentistry may be worse for a patient than none." The logic of these statements is not apparent. It is true that more quality is needed in dentistry—just as more quality is needed in every thing in American life today. But certainly more quantity in dental services is equally needed. Poor dentistry may be worse than none; but the poorest type of dentistry practiced today, the type that is mainly responsible for most of the criticisms against dentistry is the type wherein the operator turns over to a dental mechanic the making of appliances that the mechanically and surgically incompetent operator foists on an unsuspecting patient. No greater calamity could come on the people than an attempt to make of the dental profession a supercilious go-between for the dental mechanic or technician and the patient. This, for dentistry, would be like the return of medicine to medieval practice, where the physician looked wise and gave abstruse advice, and the despised surgeon or midwife rendered vitally important services to the patient.

The employment of the stomatologist and

the technician has been tried with disastrous results in various European countries, and Dr. Gysi's report thereon, made some three years ago, should be sufficiently illuminating to discredit that possibility to America.[2]

Dentistry will command the respect of the layman and the other professions when it can render to the public satisfactorily those services for which the public looks to the dental profession, and never will it command that esteem until it can render such services.

I do not believe that it is possible to condense the dental curriculum into three years unless much that is now taught in the first and second years of the dental course is put into the proposed two years of predental academic college work, but if that is the purpose, why disturb the present course of one year predental and four years of dental work. The sum total in either case is five years for the study of dentistry. My experience of more than twenty years engaged actively in teaching dentistry convinces me that more time is needed to teach dentistry thoroughly than the proposed three-year course would provide.

If certain institutions feel able and desire to try out Dr. Gies' plan, let us give them a free and full opportunity to do so. I like this suggestion of Dr. Gies very much, as it will put the matter through a square test. If it proves effective and desirable, then other progressive institutions will quickly adopt the plan. If it should prove to be a disappointment, the whole fabric of dental education will not have been endangered; and dental service to the public will not have been rendered ineffective or unattainable.

A. W. Thornton, Montreal, Canada: For the past ten years I have been connected with the dental department of McGill University, one of the smallest of the schools in either the United States or Canada. When I went there, they had only twenty students. They have now only 120 students altogether. We have a peculiar condition there, in that education in the Province of Quebec is somewhat complicated on account of the two races living there, owing to the fact that they come under different educational systems. Within the last ten months, we have gotten together as dental educators and settled the difficulty that has divided the two races for many years in regard to matriculation. We have adopted a two-year arts course as the prerequisite for entering on the study of dentistry in that province.

The dental department of McGill was first started as a department of medicine, and was governed by what was called the dental executive committee. It was a makeshift arrangement all around, but it has not turned out so badly. One thing for which I have always been grateful is this: The clinical work was put into a little room in the hospital, an old morgue, where it continued for a little while, and when the number of our students had increased, we obtained more commodious and fitting quarters. Now we have a separate ward in the hospital, but we have this advantage: About four years ago, we were created a faculty of the university, and we have been governing ourselves ever since. Our work is still carried on in the hospital, and we have the same recognition in that hospital, and must assume the same responsibilities, as all specialties in medicine. Dr. Lyons, in his paper presented yesterday, drew attention to the fact that few dental students went out to their life work with any knowledge of hospital practice or hospital ethics. In no other way will dentistry ever attain the position to which it should aspire, until its work is done side by side with the work of the medical men in a hospital. People come to a dentist for exactly the same reason that they come to a medical man—to be treated for some pathologic condition. They are sick for the time being and should be treated in exactly the same way.

We have there at the present time another advantage. Every subject common to both dentistry and medicine is taught by the same man to both medical and dental students at the same time. It is true that in some cases the subject is carried a little further than another, when the students come to regional work. It is a law in the Province of Quebec that medical and dental students must spend two years in the study of anatomy. The dental students are in the department of anatomy every morning during the second year and are taught side by side with medical students. The result is that, when these men are graduated, they have been together year after year, and after they go out each knows the other; he knows what the other knows, he knows the limitations of the other, with the result that there is mutual respect and understanding.

There is one thing that has always ground me just a little as I have heard it many, many times, and that is, that we have not the same social position or possibly the same financial condition that the men in medicine have. I want to say that that has not been my experience. There has been no apparent effort, at least on the part of medical men, to "rub it into me" that I have been poor financially or that I have been an undeveloped, low-down doctor socially or mentally. I feel that I have received everything to which I have ever

[2]Gysi, Alfred: Graduate and Undergraduate Instruction in Europe and America, A. D. A., 7:901 (Nov.) 1920.

been entitled. But here is one thing in which we have perhaps failed: We have been dentists only in too many cases—we have not taken a proper part in the public work of the community in which we have lived, and so perhaps for that reason the position we occupy is due to the inherent modesty of the dentist or possibly to the longer professional recognition of the medical man. But I do not believe it is due to either, but that we have not known each other so well as we should. I have therefore drawn attention to the fact that we should be educated together, that the dentist should know something of hospital ethics and practice; that the members of the two professions should stand side by side and shoulder to shoulder, be educated together, and that the time is already here when we will receive all the recognition and all the honor to which in any way we are justly entitled. What we want is a better class of better dentists, because the world is, I believe, suffering from a lack of good dental service more than from any bodily ailment of which we have any knowledge. Therefore, we must face the future determined to give the best possible service to the greatest number of people. In that way, we will obtain and retain all the respect that should come to any man who is trying to give service to his suffering fellow men.

Alfred Owre, Minneapolis, Minn.: Fifteen years ago, the Dental Faculties' Association of American Universities met in Boston for the purpose of organization with the one objective of placing dental education on a fit level of training for a learned profession. We, of course, sought the aid of the Carnegie Foundation as the suitable agent for the undertaking. Three years ago, when the Foundation announced it would make this survey, I told my friends in Minnesota it was the happiest moment of my life. I am not now sure whether it was that moment or this. I believe the climax came with the reading of Dr. Gies' report.

We have at the present time a five-year program in a large number of schools. Perhaps by 1925 we shall have a great majority of them on that basis, and, as has already been intimated, it will require only a slight readjustment to accept the program which is now offered for our consideration by the Carnegie Foundation. I see no serious difficulty in carrying it out.

Another item I want to discuss is the bugaboo of not having enough dentists. Without absolute data on the subject, and without an accurate survey of the situation having been made, I cannot believe that, any more than I take for granted the truth of such a statement as was made the other day when a speaker said that a certain committee had demanded that the universities, to meet the demand, should graduate 200,000 engineers by 1930. We should get our survey. In the absence of data sufficiently accurate to enable us to determine the real need, we must conduct our work on such an assumption as that. We had this matter brought up so many times that we finally made a survey of this condition in Minnesota, and found that, of all towns having a population of 1,000, only one or two asked for additional dental service, and of the towns having 400 to 499 population, only fourteen had asked for additional dental service. Towns between 200 and 400 population requested additional dental service, but in very small numbers. I am aware that many of you may have different conditions in your communities; but without a survey that will permit the presentation of absolute facts, we should not take at face value any dogmatic statements made in this loose way.

As to our equality with other dignified professions: A short time ago, when serving as chairman of the committee on dental education of the Dental Faculties' Association of American Universities, I was asked to see the Committee on Medical Education of the American Medical Association in order to determine what could be done in the matter of a joint curriculum. The conference ended almost abruptly because the chairman said, "You must qualify with similar entrance requirements; then we will talk joint curriculum."

Another matter referred to is the bugaboo of dental mechanics and what they will do to us. It would require too long to go into this phase, but I do not fear it. The Foundation's report will not advocate mechanics as competitors with dentists. It will require trained mechanicians, which is a quite different matter.

The report calls for a university conference on the whole question. I cannot commend this recommendation too highly. Further development thus rests where it belongs, with a group of disinterested bodies competent to formulate and carry out educational policies.

G. F. Reddish, Richmond, Va.: I should like to ask Dr. Gies to discuss with us how he can compensate for the lack of the fourth year in dentistry, if we are to keep up with and consider ourselves on the same plane as the medical profession. If we add two years of preliminary training and take off one year for the acquirement of the doctor's degree, I believe the medical profession could not consider us on an equality. It seems to me that if we are going to make application for such a consideration, we must carry out funda-

mentally the time requirements and some of the course requirements of the medical schools.

The essayist made one statement that I should like to discuss, and that is, that men who have secured a doctor's degree in institutions other than dental schools should be required to take medicodental branches. It might be difficult to get medicodental branches without carrying through to what he calls a Ph.D. degree in dentistry. If that should be the case, we probably could make such an arrangement.

I am wondering also which universities would be willing to give a Ph.D. degree without the requisite amount of research work, namely: two years in research in dentistry. I am assuming from Dr. Gies' discussion that the two years given are for the benefit of taking certain special courses that would better enable the dentist to take up specialities in dentistry, for example, oral surgery. I am of the opinion that the degree of Ph.D. is universally recognized to indicate research in the science involved.

With regard to teaching dental students with medical students, as Dr. Thornton has suggested: In our own case, we endeavor to give the dental students in our bacteriology course as much, or almost as much, medical bacteriology as the medical men receive. I might say that, in order to do so, we have to work them so hard that they do not have time even to go out into the hall and smoke, which I believe the medical men would not stand; but on account of the lack of time for bacteriology in the dental curriculum, it has been necessary to condense the course very considerably. Therefore, we have modified our course to include four phases: (1) the general scientific phase of bacteriology; (2) the medical phase, and, finally, (3) the dental phase; and throughout the foregoing (4) what we might call the general term of disciplinary discussion in medical bacteriology; that is, discussing bacteriologic subjects in the same terms as those used by medical students.

If anything we should give more time to the study of the fundamental sciences, and if that is done, it will be necessary to have four years for the acquirement of the dental degree.

Wallace Seccombe, Toronto, Canada: I would like to make a few observations dealing more particularly with the practical application of some of the principles so clearly enunciated by Dr. Gies. But before doing that, as one who has spent, in the aggregate, many days with Dr. Gies in the last year or so, I wish to pay tribute to the important personal contribution Dr. Gies has made to dentistry. He admits that he has been working "twenty-five hours a day." How he does that I cannot say, but I do know that his health and family have been neglected in the interests of dentistry. I think Dr. Gies should know that the dental profession realizes the importance of his work, and appreciates that what he has already done has gone far to improve the status of dentistry, particularly in its relation to medicine.

We adopted the predental year, four years ago. This class is taught in the dental faculty. This plan was followed primarily because of the crowded condition of the classes of the university following the war, and also because the university curriculum did not provide for a laboratory course in chemistry in first year arts. We have developed the predental year as the first of a five-year course. The university professors come to the dental college and teach their subjects. They are members of the dental faculty, and their services are remunerated through the budget of the dental faculty. This results in very close cooperation in the teaching of the basic sciences and the purely dental subjects.

We have included in the curriculum of the first year the subject of modeling, making a definite application to both dental and general anatomy. The student builds up the head and neck in clay, laying on muscle after muscle, and learning its name, origin and insertion. Also we have added a course in drawing that has a very definite application to the problems of engineering as they relate themselves to dentistry.

So that for four years we have been carrying on a five-year course, the first year being devoted to predental subjects, and the four years following being given over to the regular dental course.

In Toronto, therefore, we feel that it would be a comparatively easy matter to adjust ourselves to Dr. Gies' suggestion, namely, a five-year course, two years predental and three years dental.

We would stress, however, the advantage of having these predental years taught in close cooperation with the dental faculty. This, we believe, is a very important matter. The first year of this predental work might be taken in an arts department, a junior college or other approved institution at a location close to the student's home. First year men are at an age when it is an advantage for them to get their work in a college not too far removed from home; but we believe the second year is better taken in definite conjunction with the dental course.

The question arises, In what department of the university will these predental students register—in the arts department? In the past, we have found that it has not been always satisfactory to admit arts graduates—men who have taken four years in arts—to a three-year

dental course. The unfavorable results may have been due to the fact that the arts graduate was attempting to take a four-year course in three years.

The medical faculty of the University of Toronto follows a plan similar to that of our college; that is, the premedical work is given by the medical faculty.

As to the suggestion regarding the holidays of the dental teachers: I think it should be borne in mind that most of the dental teachers are, of necessity, in dental practice. We do not hear so much today about full-time dental teachers. It is a safe principle to follow to certain limits, but if we are to maintain the dental course in direct relation to dental practice, we must consider dental teachers as not dental teachers alone, but also dental practitioners, and while the colleges may be closed for some months, I think we all agree that the teachers are working fairly hard during those months.

Then, too, we must consider the question from the standpoint of the students. It has been asked: If these men cannot be taught dentistry in three years of eight months each, why not make the school year ten months? Theoretically, that is satisfactory, but, in practice, we find that a great number of the students require those four months to earn sufficient money to go on with their course. If they were financially independent, well and good, but we have many men who find it absolutely necessary to earn sufficient money during those four summer months to enable them to finance their dental course.

We in Toronto are very much interested in the excellent work presented by Dr. Gies. We feel that if we were permitted to carry on one year or more of the predental work in our own faculty, injecting something of the spirit of dentistry into it, and graduate the students after three years of intensive dental study, the plan might be developed with very satisfactory results.

William H. Potter, Boston, Mass.: As regards the one year of predental college work, it is a difficult matter to arrange. One year in college is not attractive to the student; it is not wanted by the university. Two years in college means something. It is an educational unit and we are more likely to induce our universities to give proper credit for two years in the academic department than for one year. It will be more satisfactory to the student and to the university. I am not in favor of injecting cultural studies into the dental or medical school courses. They should be taken in the academic department of the university.

There is another suggestion in the paper that I heartily approve of, and that is getting the presidents of our universities together. I believe that the presidents of our universities do not know so much about the dental schools as they know about other departments of the university; the dental school being a recent addition to the university. If we can get our presidents together and focus their attention on dental education, it will be a most helpful thing and will bring about wonderful results.

S. P. Capen, Buffalo, N. Y.: I am one of those ignorant presidents. However, in the last year and a half I have tried to familiarize myself a bit with some of the problems of dental education.

I appreciate the courtesy of the chairman in allowing me to discuss an aspect of Dr. Gies' presentation that I think no one else has mentioned. Before coming to that point, I might say that this strikes me as probably an historic occasion. I have had long experience in attending educational conventions held by various associations, and I doubt if I have ever heard the problems of an educational group more lucidly and forcefully summed up, and the way to a large future more vigorously pointed, than they have been this afternoon by Dr. Gies. Obviously, your future lies in the closest possible cooperation with the medical profession, but, obviously, that is not going to be the simplest thing to bring about. You may be willing to do it—I do not know whether you are; but the medical profession will still take some persuasion. I think this is one of the things that you must square yourselves to right away. The logic of the situation is absolutely irresistible. Now, if you can once break through the traditional reserve of the medical profession in this particular and let them see for a few moments what the type of education Dr. Gies has prescribed really means to them as well as to you, the barriers will dissolve almost overnight. I say that with perfect conviction because in Buffalo University we have just gone through with that experience.

The point I rose to speak of particularly is the preprofessional curriculum and the professional curriculum itself. I wonder if you realize the fix the medical profession has gotten into in the matter of the curriculum. The medical curriculum is so tied down by state and other regulations that the medical schools cannot move in any direction. I was in Omaha last week attending the convention of the American Association of Medical Colleges, and three days was devoted almost exclusively to the question as to how they could get some movement in the ice-jam of their curriculum. They have taken steps that are promising. But the point is, further, that you haven't any of that freezing process as yet to contend with, or at least only to a very slight degree. You are not dictated to as yet by your council on

education with respect to what you may do; you are not tied up with respect to the actual items in your curriculum by state laws, as is the medical profession. The medical faculties recognize two defects in their curriculum that have worried them very much. One is that the so-called preclinical subjects all come in the first two years and that the application of the knowledge gained in those courses is separated almost by a wall from the theoretical aspects of the subjects. Medical faculties would like to see some interlocking of the two. It is almost impossible to bring that about. Experiments are being tried looking toward accomplishing it, but it is one of the serious problems.

The other point is that they have innumerable specialties scattered through the course here and there, not in large enough amounts to accomplish the purpose of training specialists, but in sufficient quantity to clutter up the medical curriculum and interfere with the proper presentation of the more important subjects.

If you could attack the entire problem represented by the dental curriculum, including the preprofessional end of it, and say, we need this and this and this to train the dentist, rejecting that which is not needed, you would solve these questions by dentistry. I think you should say to yourselves: we do not care anything about the order that the medical school has adopted; we will find a better order if one is available; we will not necessarily choose the topics the medical men have taken, but we will adjust the curriculum to the job. If you will do that, I have no doubt that the economies in time which Dr. Gies has outlined are entirely feasible. On the other hand, I think you have an opportunity to make one of the really important contributions to American professional education, which will react also to the benefit of medicine. The larger things cannot be done without money, and I should like heartily to second the remarks which Dr. Gies himself made and which the last speaker emphasized. The universities must recognize this dental problem and be willing to invest in its solution, and your Association can help them to do it. I think, however, that when the report presented by Dr. Gies is published, it will be the one convincing piece of evidence to university administrators that this is necessary.

S. P. Brooks, Dallas, Texas: I happen also to be one of those needing enlightenment. I do not belong to the dental profession, but have been intensely interested in the discussion of your problems. I claim at least to understand things when they are spooned out to me, as I have heard this and correlated subjects discussed at the meeting of the American Association of Medical Schools held in Omaha, at the Congress on Medical Education, which is now in progress, and at this meeting, during a period of nearly nine days.

Chancellor Capen has clearly shown that there are some hard and fast lines drawn in the realm of medical education. It seems to me that while you are in this flexible condition, you might avoid serious mistakes, and I heartily endorse what Chancellor Capen has said.

The paper presented by Dr. Gies I do not feel competent to pass on, either as to the details of the plan proposed or as to the time element involved. But I believe it is inevitable that some such plan as that outlined will come to pass. I do not imagine that so great a profession as yours, so intimately interlocked with and related to the healing art as exemplified in medicine, can find itself in a corner and be satisfied. To say that does not impugn the motives of men who might disagree as to the methods by which it is to be attained. They have already been cautioned that time may wisely be used. There may be some studies involved in the academic requirements that you can adopt as they are now given, and some may need to be changed to meet your requirements. I frankly admit that, as the president of Baylor University, which includes a dental department, I resent the implication that the Dental faculty is inferior to the faculty in any other department, as that of law or medicine. On the contrary, when I consider the limitations under which the members of our dental faculty have worked, I marvel that they have done as well as they have, and I marvel also that the profession has done as well as it has, having been thrust off in a corner by medicine in the long ago.

It has been suggested that there might be a little more self-assertion on your part. Dignity, however, must not grow faster than the knowledge that accompanies it, and we may as well understand that dignity comes to those who deserve it. And I think I can say as one looking in on you that it is coming to you fast. I do not underrate the fight that comes from changes. The world has been built, as far as I know, by the everlasting God through processes all His own, through time. All of the educational processes come that way. If there should be passed here and now a requirement for the institution that I have the honor to represent, to raise its standards to the highest point proposed, with the glorious hard time we have now, it seems to me, it would be our finish. But I decline to remain a pessimist as to the change that has been proposed. Go your fastest and we will do our best to keep up.

Marcus L. Ward, Ann Arbor, Mich.: It has been quite generally known that the universities of this country that were supporting dental education have for several years been urging a survey of dentistry by the Carnegie Foundation with a view to establishing the obligations of these universities and to eliminating the objectionable mercenary elements that are now impeding our progress.

Since the survey was undertaken about a year and a half ago, all concerned have, with considerable apprehension, watched for the report of the Foundation through its representative, Dr. Gies. Those who have been supporting dental education on the same basis as other branches of education and who have considered dentistry an essential branch of health service, have had a feeling that the report of the Foundation would to a large degree approve of their work. On the other hand, those who have claimed that just as good a school could be operated without the influence and support of a good university as it could with them have, as a rule, I believe, known that the Carnegie Foundation or any other one representing the public could make no other report than such a one made by Dr. Gies. Subjects of controversy between the private, semi-private and university schools extending over approximately two decades are, I believe, settled by the portion of the report read today. Teachers, administrators and boards in control of influential institutions that have carried the burden of financial outlay and personal effort connected with not only this but also any pioneering project, will welcome the statements made by the essayist that more cultural work should be made the basis of the study of dentistry, and that the university is the best place for it.

The moment we accept these statements as truths we have eliminated the real causes of the controversies that have occupied so much time and attention during the last fifteen or twenty years, with one exception, the one concerning the vested interests. We have had meetings of our teachers for many years at which it was very apparent that discussions were influenced by vested interests by inability or disinclination to become an integral part of a good university, or by a lack of appreciation by the discusser of the necessity for a better foundation for the study of dentistry.

Those of us who have been associated with Dr. Gies in his study have found him to be open minded and very thorough in his search for information. The Foundation's obligation to make an impartial report is too well known to need comment at this time as a substantiation of the reliability of the report. It would seem, therefore, that we might proceed hereafter to the adjustment of dental education to a good university standard as fast as this can be done, in justice to all concerned. We cannot hope to eliminate immediately all of the ills of eighty years of independence. We can, however, refrain from further angry disputes about the desirability of placing dental education on a good university basis, and proceed to a utilization of the benefits that accrue to this status.

I am especially pleased that Dr. Gies finds himself in accord with the views of most of those who have given the matter serious and unbiased consideration that dentistry can be most effectively taught by a faculty for this purpose, that is, in cordial cooperation with faculties of medicine and engineering. We have in dentistry at this time many men who have seen it develop for the last twenty-five years into a most useful branch of health service, through the utilization of information in the schools of medicine and the colleges of literature, science and the arts and of engineering. Take away the instruction given in any one of these, and great inroads are immediately made in dentistry. Moreover, ask any one of these schools and colleges to teach what is necessary to produce a good dentist and they are obliged to decline. None of them can do, in a manner more than creditable the work in which they are now engaged, on account of the tremendous demands made on them.

The long series of statements made by Dr. Gies following the one that "Intellectual and social equality with medicine cannot be attained by dentistry unless predental education is made equal in academic quality with premedical education" represent an equal number of conclusions that seem logically to follow the fundamental statement. The advantages to be obtained by the adoption of what he calls the 2-3 plan instead of the 1-4 are concisely stated, and while they may not be thoroughly appreciated by some of those who have not tried the 1-4 plan, are in harmony with the recorded experiences of the older branches of education. Hasty consideration by those who have not developed a curriculum on a 1-4 basis may cause them to consider the proposal for 2-3 plan a proposal in a retrograde direction. Our experience in the development of a curriculum on a 1-4 basis has caused us to insert into the dental course fifteen hours of purely literary work in order to meet the requirements of advanced teachers of medical subjects, and now we often find students lacking in language and mathematics. The thirty semester hours now required in the predental year and the fifteen now in the dental course are an admission on

our part that one and one-half years of literary work is essential to adequate preparation. Readjustment to a 2-3 plan, therefore, with the well recognized advantages that go with it simply means an exchange or transference of one semester of the work we are now doing. It is easily conceivable that a more mature and better prepared student can do better work in a shorter time than is at present occupied in learning dentistry. I have for several years regarded some of the conventional courses in technics a most ridiculous waste of time. It is seldom that they are based upon a knowledge of physics and mathematics as are those in engineering colleges. Moreover, they are not often well focused toward the preparation of the student for present clinical practice. In addition to those imperfections in our present system of education, there is the problem of inefficiency as a result of the employment of part-time teachers in responsible positions. No one who has had the privilege to outgrow this malignancy in dental education can doubt the statement that much time may be saved by the employment of full-time efficient teachers. This is especially true in technical and clinical courses. The change from a part-time or otherwise inefficient teacher to a full-time efficient one, who begins tomorrow where he left off today, will work amazingly well with the lower half of the class. As it is now, in most places, the lower half of the class sets the pace for the whole class and spends weeks at some of the relatively unimportant pieces of technical and clinical work. With a full-time efficient staff to give the necessary demonstrations and personal attention whenever a section of the class is ready for them, and the facilities to carry on the work, it is very possible to shorten the time for this work very materially for the better students. The deadly practice of having a requirement of so many weeks in technics, or so many pieces completed, instead of a certain standard of proficiency and the facilities to offer the next step as soon as this proficiency has been attained, furnishes a fertile field for study for those who doubt the wisdom of trying the 2-3 plan.

The statement that the 2-3 plan offers a very suitable foundation for successive degrees, as well as the one assuring us that nothing new in principle to a university is contained in the plan does not seem to be open to discussion at this time, for they have been accepted in principle in all well developed branches of education.

Dr. Gies (closing): Although I assured you there would be no reply to your criticism, I am impelled to say, in expressing appreciation of the generosity of this body, that I am both greatly and gratefully disappointed. Your criticism has been neither general enough, severe enough, nor direct enough. I have listened intently. Everything the speakers have said in dissent will be carefully considered and duly weighed before the publication of the Carnegie Foundation's report on the study of dental education. I should be glad to receive from you individually the criticisms you have withheld, and hope to confer with all who may be disposed to "talk matters over."

I feel that the paper should have been handled more roughly. I am sure your forbearance arises from the generous personal sentiments which several of the speakers have voiced. I wish, accordingly, Mr. President, to extend an expression of my very sincere appreciation of the fact that although I have been direct and apparently unsparing, you have received the paper cordially and magnanimously.

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Editorial

A NEEDED READJUSTMENT IN DENTAL SOCIETY EFFORT

It is beginning to be recognized by some of our thinking men that the present plan, or lack of plan, of conducting our various state organizations is impractical, unwieldy and expensive in a degree. In any movement that has developed as rapidly as has the dental society movement, some attention must be given to the systematic arrangement and management of the different entities entering into the movement. Otherwise, there will be duplication of effort and more or less confusion. When the profession was practically unorganized; when each state society went its own way and pursued its own policies without reference to any other organization; when there was no central body under whose wing these various state associations functioned, the need for cohesive and systematized management was not so apparent. But when the component society plan was inaugurated in our state organizations, and particularly when the state societies elected to become components of the great central body—the American Dental Association conditions so changed that there should have been a corresponding change in the plans for holding the state meetings. Instead of this, the states proceeded for the most part precisely as they had before. They arranged for their meetings regardless of what other states in their immediate vicinity might do, and frequently the attendance at their meetings and the results accomplished showed the effects.

It began to be apparent that there was some difficulty in securing the best talent to entertain the members at all of these scattered meetings, and it was also found, that without good talent, the attendance dwindled. In some sparsely settled districts, the societies suffered, and in a few states there were no meetings at all in 1923 and 1924. The dentists in these states are just as much in need of dental meetings and just as much entitled to them as are those of other states, and the parent association should take cognizance of this, and, if possible, should foster

some plan whereby all its component members can have access to the benefits of association influence.

In a group of states in which the membership is limited and the burden of conducting a successful meeting is correspondingly great, a plan might be worked out whereby two or three states could combine in a single meeting and alternate in the different states at different times, so that each state would at certain intervals feel the stimulus of having a real live constructive and inspiring meeting in its territory. Several tri-state meetings in the past have demonstrated the great possibilities of such a plan. The time might come when it would be feasible and proper for the parent organization to send essayists or clinicians to such meetings, and thus show its vital interest in every one of its components, no matter how remote from thickly populated centers. Eventually, it might be found practicable for more and more states in contiguity to each other to combine in these joint meetings as their greater value became apparent.

Another matter for consideration is a better arrangement of the dates of the various state meetings. One feature of these large meetings that must be reckoned with is the presence of the exhibitors. Many of the members from outlying districts attend the meetings largely to see the new things that are coming out in the way of equipment and materials. Without the exhibits, our meetings would lose much of their attraction for a large number of the profession. Therefore, a legitimate consideration should be given to the exhibitors, and this has not always obtained in the past. State meetings have been so dated that exhibitors have been compelled to jump back and forth across the country in unnecessarily long and expensive trips in going from one meeting to another.

That this a matter for our members seriously to consider must be apparent when it is remembered that all this unnecessary expense eventually comes out of the profession: it can come from no other source. After all, the interests of these two groups—the supply people and the profession—are mutual, and there should be a closer cooperation between them than there has been in the past. This, we believe, is soon to be brought about. President Giffen has appointed a committee from the American Dental Association to meet with a similar committee of the American Dental Trade Association for the consideration and discussion of matters of common concern to the two organizations, and we confidently predict that much good will come from this movement.

We are also informed that Dr. Giffen will discuss in his president's address at Dallas the feasibility of a better management of our dental meetings, and will suggest plans for their more systematic arrangement,

with a greater conservation of time, energy and money. This is a subject which must be taken up with all seriousness in the near future, and it will require the greatest wisdom on the part of our representative men to solve it for the best interests of all.

SHYING AND EVASION

There is a class of men and women who are always looking for and expecting slights from those whom they suppose consider themselves their superiors. Somehow or other they habitually entertain a suspicion that certain people feel above them; so when they pass them they shy at them—go around them—and will not give them a chance to be civil to them.

There is no more thankless task than the attempt to assure such shying and evasive people that we desire to love them, that we want to respect them, and that we would be glad to continue their acquaintance. They seem to feel, however, that if one is civil to them that they are being "patronized." On the other hand, if one waits for courteous advances from them, he will wait in vain, for such advances upon their part they would consider as "toadying."

Would that it could only be understood by those who are so uncertain in regard to their positions, and so suspicious that everybody has the disposition to slight them, and so much afraid of being "patronized," and so averse to "toadying," that their sentiments and feelings are in themselves good and sufficient reasons for everyone to hold them in contempt. In comparison with the person who carries an unsuspicious, self-respecting, open face, *into any presence,* such people as these seem unworthy of the race to which they belong.

The man who bears an unsuspecting, unassuming face, who endeavors to be civil to everybody, *who minds his own business,* and does not show by his demeanor that he feels inferior, and whose bearing indicates that he considers himself a man and expects to be treated accordingly, will secure courtesy and respect from every *real* man and woman in the world. The man who shies, suspects, evades, and secretly envies, and is full of petty jealousies, and concerned that he will not get all that is due him, is sure to be held in contempt, and who can deny that he well deserves his fate?—*The Kalends.*

ALL MUST BE SERVED

In this day of excitement, of restlessness, of dissatisfaction, of grasping for the luxuries of life, the medical profession must exercise extraordinary care that the general trend of the times does not draw it into the whirlpool of desires to the debasement of its time honored and time respected ideals and convert its professional idealism into business acumen and trades union selfishness. Respect for self and respect for our profession demand that our service be adequately recompensed, but we must be ever mindful that the fees which we exact should also be commensurate with our patient's ability to bear financial burden, and that the overburdening of the patient with professional charges is a large factor in driving a proportion of our population into the care of clinics and welfare associations, to the patients' degradation as being dependents, the doctor's disgrace as being grasping, and the profession's reproach as debasing its high ideals. More and more is the practice of medicine invaded by the governmental, social and welfare organizations, to the ultimate harm, as we believe, not only of the profession but also of the people, and commercialism on the part of the individual doctor will promote that movement which we recognize as a menace. It must not be truthfully said that only the very rich and the very poor can receive adequate medical care.—G. E. FOLLANSBEE, *in the Ohio State Medical Journal.*

DEPARTMENT OF DENTAL HEALTH EDUCATION

RED CROSS ACTIVITIES IN DENTAL COMMUNITY SERVICE

By JAMES L. FIESER,* Washington, D. C.

IN 1919 the American Red Cross set to work intensively on a great national peace-time program, some features of which had been attempted in a limited way in the years immediately preceding. On the surface apparently divergent, each item of this plan was arranged to penetrate the different ramifications of modern life and to accomplish one end, the logical outcome of the Red Cross aim in wartime activities, which may be summed up as the preservation of life and the insuring of health through prevention and better public understanding.

Working at the main problem, but taking it from different angles, it has been found in these five years of practical effort that people generally do not realize the significance of several factors in public health. Dental care is one; and to arouse the public to an appreciation of its importance and value is a necessity. Accordingly in many Red Cross chapters, the promotion of such service has become a part of the regular health program, and the workers are hammering away at the task of awakening their community to the need for dental care. An effort to stimulate people to seek information regarding care of the teeth and value of oral hygiene, and to provide such reparative work as is absolutely essential in order that sickness may be eliminated, children kept healthy and the physique of splendid adulthood developed, has been a part of the chapter's plan of work in countless places. Through health teaching in schools and homes by public health nurses and nutrition workers of the chapter, through talks to the children in the schools and before mothers' clubs and teachers' associations given by dentists and arranged for by chapter workers, the public is being aroused. Another factor in this awakening of the community is that, in physical examinations in school, the dentists examine the teeth while the physicians make the rest of the examination.

In the dental program of practically every chapter, the emphasis has been laid on work for children, with particular attention to the first graders and to the preschool child; this, because school inspections have revealed the fact that the older child who visits the dentist has teeth too long-neglected to be saved.

Taking stock of the communities in which propaganda for dental care is being carried on, it is apparent that the chapter renders three types of service: (1) in developing an appreciation of dental service in communities in which it exists but is not properly valued; (2)

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in supplying dental service in those communities in which there is none; (3) in providing dental care for families who cannot afford it in whole or in part.

An illustration of the first type of service may be given from Le Sueur County, Minn. Here, a dental examination was arranged at the county fair, and dentists came from various parts of the county to examine the children. For publicity, first, second and third prizes for the best cared-for teeth were offered for six groups, three for boys and three for girls from 3 to 6 years of age, from 6 to 12 and from 12 to 16. To the mother bringing in the largest family of children for examination, an additional prize was offered. Though the attendance at the fair was not large, 220 adults and children visited the clinic. Incidentally, in the attempt to awaken an appreciation of dental service, workers sometimes arouse dentists themselves to the need for organization. In Le Sueur County, this need was so clearly demonstrated in course of the preliminary arrangements that the dentists are now planning such an organization.

The effort of the Miner County, S. D., chapter to arouse public appreciation took the form of an eight-day dental clinic, which was arranged last August. There are 16 townships in the county and four dentists, so equalizing the work planned was an easy task. Each dentist worked in his own office, and in two days gave the dental care needed by the children of four townships. Altogether, 370 children took advantage of the clinic. With what results? They learned their way to the dentist's office. Their fear of him was banished. Each had his or her teeth cleaned and necessary extractions made. An instructive talk was given by the dentist to every child. Incidentally, as a follow-up measure to the work done at the clinic, the schools have instituted toothbrush drills this year. In this case, the dentists were paid from a fund raised for the purpose.

The effect that this kind of educative work is having on adults may be summed up in a story which comes from Fort Dodge, Iowa. A dentist there, noting the fact that many men traveling about the country now called on him for attention to their teeth, commented on the fact to one of them. The latter replied "You know, the Red Cross put nurses in our schools to teach health to our children. We got our lesson on the importance of our teeth from our children."

The matter of providing dental service where there is none is a problem very common to many of our rural chapters. In some states, it is simplified by the dental resources of the state board of health, which can provide an itinerant dental clinic. But, more often, a great deal of work is involved. Actual instances can illustrate both points better than explanation.

In Buchanan County, W. Va., the Delano Red Cross nurse has spent much time and effort in endeavors to supply dental service to this country, which has none. The resources of the state board of health were tapped and a two months' clinic was arranged, covering the need in five localities. To stimulate interest, speaking engagements were arranged for the dentist, and that the opportunity might not be lost, in those engagements which the dentist could not fill, the nurse took his place.

At Hurley, the clinic was attended by fifty-three pupils and lasted for three and a half days; at Matney, by seventy-one pupils, for three and a half days; at Whitewood, by fifty-five pupils, for four and a half days; at Triangular Mountain Institute, by thirty-nine pupils, for four days. At Council, the clinic scheduled for a week or more was still on when the report from which these facts are quoted was sent. This is the first time there has ever been anything of the kind in the whole county, and the response was quite satisfactory. At the

first four towns mentioned, the payments made afforded $179 toward the cost of the clinic. In this connection, it must be remembered that, unlike the other nursing service maintained by chapters, Delano Red Cross nurses go only to isolated communities unable to make public health service self-supporting even though there is great need for the work. It is a special service made possible by that great hearted woman, Jane A. Delano, who, up to the time of her death in France, was head of the Red Cross Nursing Service, and who made provision in her will for this especially fine type of nursing work.

The work of East Franklin County, Orange, Mass., is an instance of the second point. After analyzing considerable material on dental equipment, prices and dental clinic costs, the workers came to the conclusion that the studied plans were either too expensive or were unsuitable for local needs. They solved their problem by approaching a dentist in a nearby town in regard to a flat charge for dental work in rural schools. The plan as finally worked out was this: For $15 a day, guaranteed, the dentist promised to supply all the necessary materials, instruments and foot engine. The chapter arranged transportation and luncheon; and purchased a portable dental chair; and, if the money received amounted to less than the $15 promised, because of the work done for children whose parents were unable to pay the full cost, was responsible for any deficit. On a prearranged and well-announced schedule, three or four days was given to each school although small, because no dental work had been done prior to this time. After school hours, any adults who cared to go to the school received attention. Now that the teeth are in good condition, it is estimated that a day in each school once every six months will probably suffice to continue the care.

In eight months, the dentist earned approximately $500 of which only $15 was paid by the Red Cross, $15 by the grange and $15 by a civic improvement club. The parents themselves practically paid for the dental care their children received when it was provided in an accessible spot. So much interest has been aroused in many of the small towns that it is possible several will make an appropriation for the work another year. The chapter is now trying to interest a dentist who recently graduated to locate in this newly awakened territory.

Another illustration of the second type of service rendered comes from Ashland, Mass. The success of the nursing service here led the committee in charge to attempt in 1921, the establishment of a dental clinic for the benefit of the 350 children of the three schools—high, grammar and primary. Careful estimates indicated that its cost would be about $75 a week including supplies but not provision for quarters or equipment. The local Junior Red Cross contributed $65 to the experiment, and the public health nursing committee guaranteed the remainder. Permission to use one of the smaller rooms of the town hall rent free was obtained. The dentist engaged to take charge secured free the use of a suitable chair and a foot-power dental engine from a prominent firm dealing in dental supplies, the transportation of which from Boston was the contribution of a local business corporation. Printed circulars with an application card were sent to the parents, and when these were received, the Red Cross nurse sent out appointment notices. Considerable ingenuity was needed to provide transportation for children living at a distance, but the system of consecutive appointments for children in the same district solved the problem and one automobile sufficed. The clinic, which was attended by 114 patients, was 70 per cent self-supporting. It was interesting to the organizers to note that, contrary to tradition, the children were impatient to visit the dentist, and the more general the attendance of children from any one

district, the more anxious were others in the same neighborhood to share the new experience.

The problems of transportation and organization connected with the central type of clinic, such as this one, form an eloquent plea for itinerant clinic service rather than a stationary service at just one center for each rural school. Not only is this the solution of the difficulties already mentioned, but it means a larger field for educational work that is also more effective. Each school is interested; many more teachers are educated when their cooperation is enlisted; the mothers are more interested because they have a kind of proprietary feeling toward truly local clinics in the schools that their children attend.

The instances of provision of dental care for families who cannot afford it in whole or in part, which is the third type of service the chapter renders, are innumerable. They cover the country from the Atlantic to the Pacific. What cooperation between the Red Cross and the local dentists can achieve is splendidly illustrated in the following stories of actual work, selected with a view to showing the various types of arrangements suggested by the ingenuity of different chapter workers.

In April, 1921, the executive committee of the Hampshire County chapter in Massachusetts authorized the expenditure of $2,000 for the holding of dental clinics for children in eight towns in the country. A committee was appointed to make the arrangements for the purchase of dental equipment, to engage a dentist and to appoint committees in each town to cooperate with the chapter committee. These committees provided a well-lighted room in which the equipment could be set up. They assisted and still assist the dentist by making appointments for him so that there is no loss of his time. In several towns, the school nurse is a member of this committee, and her knowledge of family conditions is a great asset. A nominal charge is made if the parents can afford to pay a small sum. As there are a number of dependent children in some of the towns they receive the benefit of the work at the expense of the state. In towns in which the homes are widely separated, the best way to inform the parents of the work is often through the schools, the churches and the grange. By more recent arrangement, the parents send in written requests for dental care for their children, so that there can be no misunderstanding. Emergency adult cases in towns half a day's journey from a dentist have also been treated. The work in each town was thoroughly covered in the first year, usually, and the ground is gone over now for follow-up cases. There has been great interest in and a general demand for the work. A member of the dental clinic committee says: "In all of my volunteer work for the Red Cross during the last five years, I have never found anything that gives such satisfactory returns for the amount of money expended."

Norristown, Penn., with a population of 32,319, in April, 1923, opened a dental clinic for children from 6 to 10 years of age. The Red Cross chapter gave $500 to the Montgomery Council for Social Welfare to furnish the equipment and this year has been providing $50 a month for the payment of the services of two dentists two mornings each week. Thirteen Norristown dentists voluntarily maintained the work of the clinic last year by giving two mornings each week from 9 to 12 o'clock, and several still give free service. More than 500 children have benefited by the dental care given in this clinic.

A free dental program was planned by the Wabash County, Ind., chapter, in the spring of 1922. To divide the work so that undue demands are not made on any one dentist, the eleven dentists (seven in Wabash and four in North Manchester) agreed to give half a day a month if they could work in their own offices rather than in a spe-

cial clinic with unfamiliar arrangements. The children are allocated to dentists in alphabetical order. As the county is divided into a northern and a southern district, two children from Wabash and two from the southern part of the county go every week to a Wabash dentist and two from North Manchester and two from the northern part of the county to a North Manchester dentist. Eight children, therefore, receive dental care each week.

In some towns the school board or another organization has been desirous that the children get the excellent habit of dental care early in life. What they learn when young, they are likely to continue when older. There are three instances in which this has been put into practical effect and approved by the local dental society; and because of the splendid work done in Portland, Ore., and Seattle and Tacoma, Wash., much of which is the result of the financial aid furnished by the local Junior Red Cross, community dental care has made excellent progress on the Pacific Coast. In Portland, for instance, where the service was started in October, 1920, five paid dentists and five assistant nurses are employed on a part-time basis. Circulars, letters and talks were used to interest organizations and people in the clinic. A general educational and prophylactic program has been most strenuously carried on, in addition to the reparative work. At first, the Junior Red Cross financed the program at a cost annually of about $10,000. Then it originated and successfully put through a campaign that secured the passage of an act by the state legislature enabling the school district to take over the work.

In Tacoma, the dental service, which began as far back as 1909, was under the jurisdiction of the school board until the United States Supreme Court ruled that tax money could not be used for such a purpose. The Junior Red Cross then took over the responsibility of the health corrective work in the public schools. A paid dentist is employed on part time, and he is on duty five mornings a week. Only cases investigated by the five school nurses are treated.

Seattle has two paid dentists and one dental hygienist in its clinic employed on full time. The Red Cross chapter in April, 1921, took over the work under its Junior Red Cross program from the school board which had conducted it until the Supreme Court ruled that this was illegal. Last year about 6,000 dental cases were treated. The clinic costs about $14,500 yearly of which the school children raise approximately $3,000.

Preliminary steps taken are not without interest. It should be emphasized that practically none of the work is planned without consultation with the local dental society or association, wherever such exists, or in lieu of that with individual consultation. The chapter approaches the representative of the society. They jointly discuss local needs and together formulate the plan that seems most feasible. Then there is the question of dental equipment, on which an expert's advice is infinitely more valuable than a layman's. In those instances in which the state boards of health have a dental hygiene section, the chapter and the dental society confer with the state dentists as well.

To give examples of the way this works out in practice: In the case of the clinics arranged by the Hampshire, Mass., County chapter, to which reference has previously been made, the Northampton Dental Club was represented at every conference of the committee and materially helped in formulating the plans; while one dentist, who had at that time been in charge of the clinic in the public schools of the city for five years, not only gave the members the benefit of his practical experience but also selected the equipment, obtaining all of it at a very reasonable price.

The dental clinic in Denton, Texas, was established in 1922 by the Denton County Dental Society and the Red

Cross, the former issuing all cards in connection with this free dental service for adults and for children unable to pay for it. The county Red Cross nurse investigates the cases so that the members of the dental society give aid to as many of the genuinely needy as is possible.

Conclusion

No discussion of the aims of the American Red Cross in regard to community dental service would be complete without reference to the attitude of the dentists. Wherever this work has been attempted, the chapters pay tribute to them. Their eagerness, their willingness, their generosity are of material assistance in enabling a great branch of health work to go forward. Local workers commenting on their attitude say they are "most interested and appreciative" or "very friendly" or "splendid."

Three things are required for any community dental service—professional skill, public interest and a *modus operandi.* While this is just one phase of Red Cross work, the stories show how these factors have been supplied: the dentists contribute the necessary professional elements, the Red Cross chapter stimulates the public interest and support, and together the dentist and the chapter develop the plan of procedure.

It is by such united effort that hundreds of thousands of children, and adults, too, have learned and are learning the value of dental care.

THE PLACE OF DENTAL HYGIENE IN THE PUBLIC HEALTH PROGRAM

By MERRILL CHAMPION,* M.D., C.P.H., Boston, Massachusetts

THE subject of dental hygiene is a very important one and deserving of more intelligent consideration than is usually given to it. It is not enough to say, "Oh, yes, our children's teeth do need attention, don't they? Let us ask the town to appropriate money for a dental clinic." That might prove to be the most unintelligent thing that could be done.

I am going to give you my conclusions in serial form right here. Those who want to read farther will find out why I came to these conclusions:

1. Dental service of some sort is a necessity under modern conditions.
2. Dental service is at present insufficient to meet the needs of the public.
3. Dentistry, as the term is ordinarily understood, is not essentially a part of the public health program.
4. The dental clinic is a necessary surgical convenience in all large communities and in many smaller ones. The traveling clinic is of the greatest assistance in isolated places. Both should be considered as essentially a means of furnishing surgical treatment and should be supported in the same way that any other medical or surgical clinics are supported, i.e., from private funds.
5. Mouth hygiene is essentially a part of the public health problem. The dental hygienist is primarily a public health worker and may properly be supported by public funds.

*Director, Division of Hygiene, Massachusetts Department of Public Health.

Let us now retrace our steps and see whether these conclusions can logically be defended. The first needs no argument. He who hath eyes to see can settle the question for himself. Nearly every adult shows dental defects; while the vast majority of school children have cavities in their teeth.

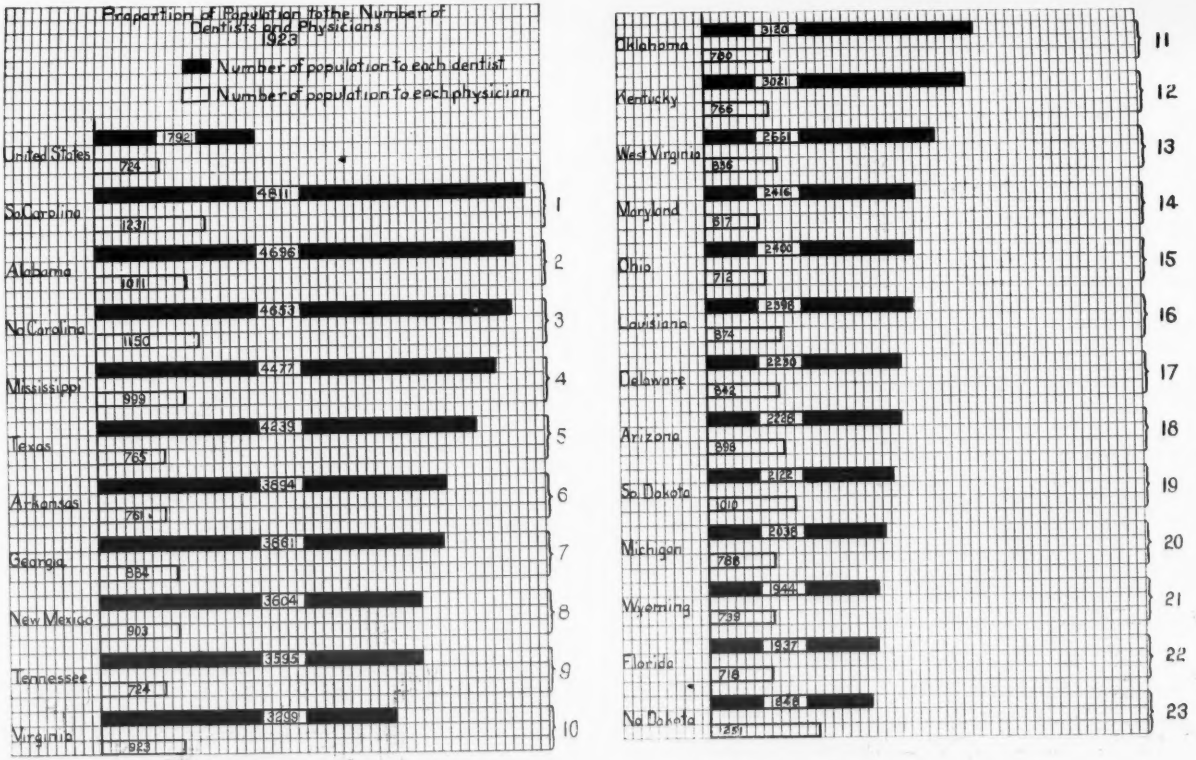
My second conclusion is based upon what the dentists themselves say. Most dentists seem to be busy. Many dentists do not like to care for children. And very many people in need of dental care do not get it. Therefore, the presumption is that the present facilities for dental care are not adequate to meet the need.

My third conclusion will doubtless be disputed by many. The common argument is that reparative dentistry is a part of the public health program because it is an agency for the prevention of diseases now being traced back to infected teeth. This is undoubtedly true in one sense of the word. Yet it is merely a confusion of terms after all. Operations on infected tonsils, on an infected mastoid, on an infected appendix—these we do not call "public health" measures; yet they all may prevent subsequent systemic disturbances.

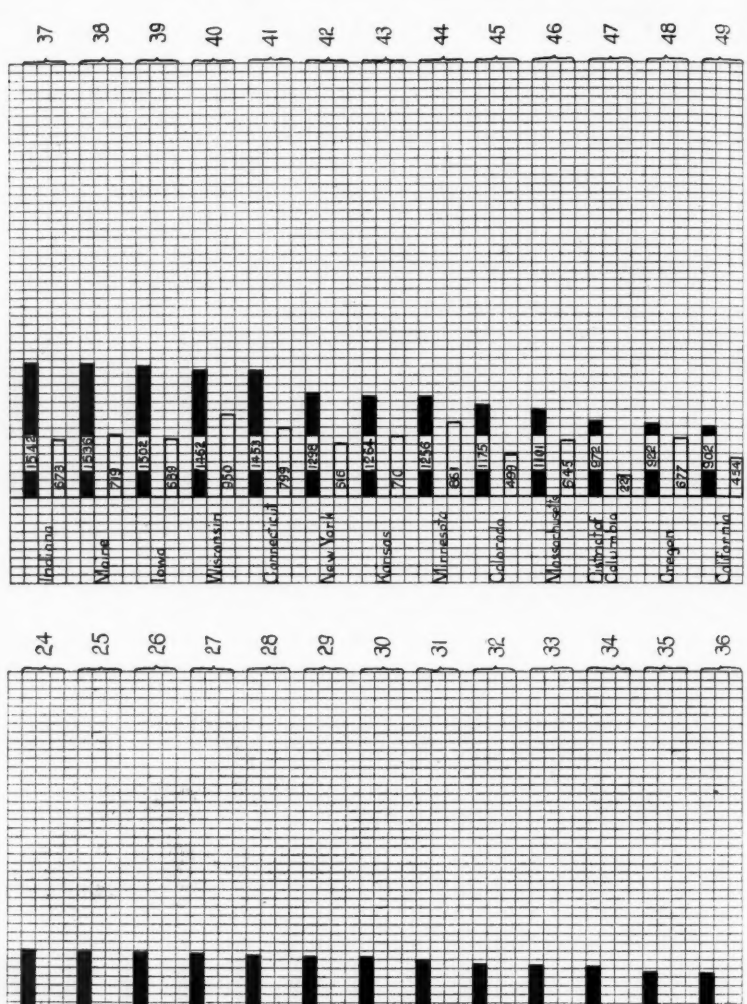
Our fourth point is one that needs a little thought. Clinics of various kinds seem to be a modern necessity, if we are to give medical service to all classes of people. The traveling clinic helps those who live in remote sections, since it gives them what they need without their being obliged to carry the expense of what they do not need. The city clinic offers to the poor good service at a cost they can afford, or at no cost at all to them. The dental variety of clinic does not differ in any way from any other variety of medical clinic and the same rules should be applied to all. The medical dispensary usually serves the poor. It sometimes sells medical service at cost. We do not expect the medical dispensary to be run by the municipality for the free use of all taxpayers. Neither do we expect the municipality to go into the business of selling medical service at cost. It is pretty generally understood in this country that the best method, for us at least, is to keep the practice of medicine a matter between the individual citizen and the private practitioner of medicine, with the exceptions above noted. In the case of many a family, this is the only way the spirit of self-reliance can be kept alive. A sense of responsibility on the part of a family for the health of its members is essential to good citizenship.

If this is true, and if we remember that dentistry is merely one of the medical specialties, we shall hesitate a good while before urging the municipality to go into the business of selling or giving away dental service.

Now as to our last point: Mouth hygiene deals primarily with the normal individual. It represents prevention rather than cure. It deals with health rather than disease. It depends on education rather than treatment. It is an integral part of public health as the phrase is customarily used. The usual exponent of mouth hygiene, the dental hygienist, unlike the dentist—or the medical man, for that matter—has become primarily an educational agent. She teaches prevention rather than cure. Even her prophylactic treatment tooth-cleaning activities are, to a large extent, only an excuse for teaching prevention. Dental prophylaxis can be entirely omitted without taking away the really essential part of the dental hygienist's work. Being an educational agent she can properly be used by a municipality since we, in this country, seem to have definitely decided for all time that education is a municipal function. Therefore the dental hygienist logically joins the ranks of public health workers along with health officers, public health nurses, nutritionists and teachers of health education. And as such may her tribe increase.


Proportion of Population to the Number of Dentists and Physicians 1923
Number of population to each dentist
Number of population to each physician
United States 792 784
So Carolina 4811 1231 1
Alabama 4696 1011 2
No Carolina 4653 1150 3
Mississippi 4477 999 4
Texas 4239 765 5
Arkansas 3894 781 6
Georgia 3861 884 7
New Mexico 3604 903 8
Tennessee 3595 784 9
Virginia 3399 923 10
Oklahoma 3120 780 11
Kentucky 3021 766 12
West Virginia 2661 836 13
Maryland 2416 817 14
Ohio 2400 712 15
Louisiana 2398 874 16
Delaware 2230 843 17
Arizona 2228 898 18
So Dakota 2122 1010 19
Michigan 2036 788 20
Wyoming 1944 739 21
Florida 1937 716 22
No Dakota 1848 1251 23

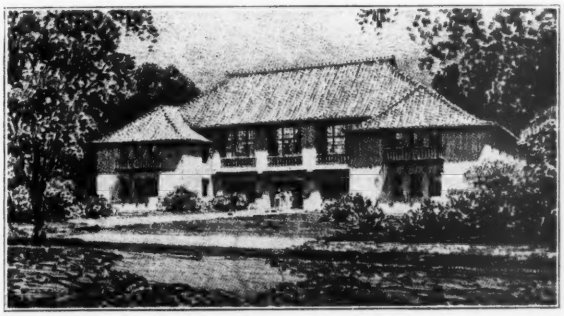
Proportion of population to the number of dentists and physicians in the United States, 1923



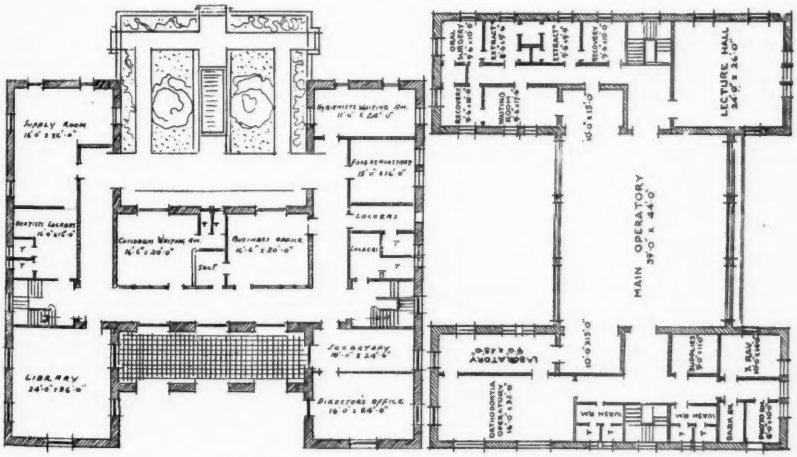
Proportion of population to the number of dentists and physicians in the United States, 1923

THE HONOLULU DENTAL INFIRMARY*

The building is located central to all city schools, and on two main car lines. Two entrances are provided for ingress from both streets and are used by the children as well as the general public. Children entering for service make their presence known by handing their names to the receiving clerk who is stationed across the entrance hall opposite the entrance and who in turn makes the necessary arrangements for the child to be received into the operatory. Children waiting for their turn remain either in the children's room, which is attractively decorated and furnished, or may go into the open court opposite the chil-



Dental Infirmary, Honolulu, T. H.



Floor plans of Dental Infirmary, Honolulu, T. H.

*From Annual Report, July, 1924.

Proportion of population to the number of dentists and physicians in the United States, 1923

dren's waiting room, where there is ample space for outdoor games. Upon signal from the operatory, the clerk sends the required number of children to the dentists. By going up one flight of stairs they land at the door of the operatory and are met by the chief operator who directs them to their proper places for service. A significant part of the first floor plan is the space allotted for a "food demonstration room." This room will be used in connection with the Dental Hygiene School for educating the students as to the importance of diet and also to demonstrate to mothers' clubs and other organizations, "what foods to select and how to prepare them."

The second floor contains the main operatory, where the general work of filling and treating teeth is done; and orthodontia and prosthetic operatory, where slight irregularities of teeth are corrected, and spaces caused by the loss of permanent teeth are filled with artificial dentures.

There are also roentgen-ray, photograph and dark rooms in one wing, while in the opposite wing and entirely separated from other departments are the extracting and various surgical rooms.

The large lecture hall on this floor will be used for the technical and theoretical training of dental hygienists, their clinical work being done in the main operatory with the dentists.

Each department is entirely separated, and children finished with their appointments retire down the opposite stairs, thus avoiding contact of incoming and outgoing patients.

FOOD MODELS

If one wishes to develop an exhibit emphasizing the relationship between proper foods and the development of the teeth, the "Food Models for Use in Home Economics Classes" will be of value. This is a tablet of eleven pages of black outlined drawings of food portions; the foods to be colored, cut out, and used in situations where it is impracticable to have real foods. Designed by Lydia J. Roberts, Chicago, 1924; individual copies 75c; in lots of 25 or more 65c each. On sale at the Chicago University Book Store, 5802 Ellis Avenue, Chicago, Illinois, where wooden blocks with slits to support the models may also be purchased at 50c for forty blocks.

NEW NUTRITION PAMPHLET

Food: Why? What? How? Washington, D. C.: American Red Cross, 1924, pp. 38.

Pamphlet prepared by Anna R. Van Meter for the nutrition service; a simple statement of the main facts of nutrition and food selection intended primarily for Red Cross nutrition classes, but adapted to the use of any person seriously interested in practical dietetics; includes tables showing the value of common food materials and typical meals as sources of protein, calcium, phosphorus, iron, vitamins and energy, and height-weight tables for children and adults.

DENTAL HEALTH PUBLICATIONS

The following is a list of publications of the United States Public Health Service, dealing with dental health. These are a few of many articles on various subjects relating to child health, a complete list of which may be obtained from the Superintendent of Documents, Government Printing Office, Washington, D. C. All of these publications, except that marked with an asterisk (*), are available for free distribution and, as long as the supply lasts, may be obtained by addressing the Surgeon General, United States Public Health Service, Washington, D. C. That marked with an asterisk is not available for free distribution, but may be purchased from the Superintendent of Documents, Government Printing Office, Washington, D. C., *at the price noted.* (Send no remittances to the Public Health Service.)

622. Children's teeth, a community responsibility. By Taliaferro Clark and H. B. Butler. 18 pages; 1 plate.

645. The fate of the first molar. By H. B. Butler. 1921, 6 pages. (Revised 1924.)

707. Good teeth: The importance of good teeth and the prevention of decay.

*890. The program of oral hygiene in the public schools of Minneapolis, Minnesota. By F. Denton White. 1923. 6 pages. 5 cents.

Medical and Dental News

CALIFORNIA

Cooperative Plan in Medical Education: The College of Medical Evangelists, of Loma Linda, Calif., is introducing a plan of cooperative work in the teaching of medicine similar to that which has been carried out in the College of Engineering of the University of Cincinnati. The freshman class for the forthcoming session will be divided into two sections; while one section is engaged in classroom work the other will be engaged in practical work in certain hospitals, laboratories and dispensaries, including work in hydrotherapy, massage and other such tasks for which their knowledge of medicine qualifies them. During the following month, the two sections will alternate, the first doing the practical work, while the second will carry the regular classroom work. It is planned that eventually this arrangement can be carried throughout a five year course. The plan has been adopted, first, because the results of the present day medical curriculum are not so satisfactory as desired and, secondly, to make it possible for a student to support himself to a greater extent while engaged in the study of medicine. The experiment will be watched with interest, since it gives promise of restoring to medical students to some extent the benefits derived from the preceptor system of earlier days. The plan is an experiment in medical education, the results of which may help to solve some of the problems connected with it.—Journal of the American Medical Association, September 13, 1924.

KANSAS

Dental Service in Kansas City: For a town of its size, Kansas City provides an unusually large number of clinics to serve the sick poor. These are largely the result of gifts of money from wealthy citizens. Several of these clinics are equipped with the most modern appliances for all kinds of operations, and for X-ray, ear, nose, throat, eye, teeth and skin work, and have the foremost surgeons, doctors and dentists of the city in attendance on the patients there. Mention may be made of only two, namely, the Jewish Educational Institute and the Thomas H. Swope Settlement. The Dispensary (Swope Settlement) includes about fourteen clinics and is admirably equipped, its premises having recently been enlarged. Here over forty of the city's doctors and dentists give their services to the district. It is not difficult in Kansas City, owing to the number of clinics, to obtain free medical treatment for children; in fact, the Deaner Institute, a recently opened and fully equipped dental hospital, is more than able and willing to care for a larger number than have yet attended. But this is no reason for pauperization, and there is a real effort on the part of the social workers, school hygienists, visiting nurses and others, to keep their people, as far as practicable, self-reliant and independent citizens.—W. Bertram Ireland, in Child Health Magazine, September, 1924.

MISSOURI

Dedication of St. Louis Society Library: The St. Louis Dental Society Library was dedicated at the Chase Hotel, October 18. Dr. Arthur D. Black of Chicago and Dr. Arthur E. Bostwick, librarian of the St. Louis Public Library, were among the speakers. As the service of the St. Louis Dental Society will be administered by the Public Library of St. Louis, a new departure in library service to a profession, it will have all of the advantages of any library without the responsibilities.

FOREIGN

Recalling John Smith: At one of the recent meetings in Edinburgh, Sir Harold Stiles, President of the Royal College of Surgeons of Edinburgh, recalled to the notice of his dental colleagues the fact that the father of dental surgery in Edinburgh had the simple name of John Smith, and he was proud to think that John Smith was a most distinguished and versatile president of the Royal College of Surgeons of Edinburgh when the University was celebrating its third centenary, and on that occasion the degree of LL.D. of the University was conferred upon him. John Smith was not only a great dentist, but he was also a great writer, a great artist, a great musician and one of the greatest composers of lyrical songs.—Dental Record, September, 1924.

Effect of Cereal Diet: Mrs. Mellanby has for some years past been conducting experiments on the growth and development of the jaws and teeth in puppies, feeding them on different diets and carefully recording the results. I think we have all been impressed by the scientific care and accuracy with which these experiments have been carried through—of course there is the obvious criticism that puppies' teeth are not human teeth and the question of caries does not come in, but the qualification seems to me a superficial one, for the similarity of the fundamental conditions is so close that the deductions made are deserving of our careful respect and consideration. It would be quite out of place to try and go into any detail of the experiments so elaborately conducted, but one is interested to note that where the cereals were concerned, white bread, oatmeal, barley and rice, the first of these gives the best results and oatmeal the worst. This interests us in Scotland and seems heterodox and contrary to what is believed to be our experience in food values, as it is a commonplace to believe that the good teeth of the Highlander of a few generations ago was due mainly to a diet in which oatmeal bulked largely; but the experiments went on to show that if other foods were also given with the oatmeal diet to the puppies, which contained abundant supplies of this vitamin fat soluble A, the development of the jaws and teeth left nothing to be desired, and it is interesting to note that Mrs. Mellanby saves the reputation of our national diet by pointing out that oatmeal is not only compatible with excellent teeth, but produces them if the other foodstuffs eaten with it contain the necessary vitamin to transform its contents into calcifying material.—J. S. Moore, in British Dental Journal, August 15, 1924.

Relation of a Factory Dental Clinic to Efficiency: Speaking generally, there are two great interdependent factors which make for wealth and happiness, and these are industrial and physical efficiency. A well known figure in the business world has placed it on record that the average output per man of the European factory worker is only a third of that of a similar worker in the United States of America. This may be due to superior organization and to the more extensive use of machinery, but there is no doubt that, making allowance for these two, there is yet, a margin of inefficiency on our side due to ill-health. It has been asserted by those competent to know that the number of working weeks lost annually in Great Britain, directly or indirectly due to diseases arising from oral sepsis, amounts to the astounding total of fifteen millions. A study of the vital statistics of our country will reveal the fact that by far the largest number of deaths are from heart disease, followed by tuberculosis and cancer. Endocarditis and myocarditis have, as is well known, often aseptic origin. In inspecting the mouths of workers, it has been found that not 10 per cent have good teeth, while at least 50 per cent, to put it conservatively, have definite oral sepsis, and the condition of their health is more or less impaired according to the extent of the trouble or the length of its continuance. —W. H. Shipway, in Dental Cosmos, August, 1924.

Rarefying Pericementitis Fibrosa (Box): In a bulletin recently published by the Canadian Dental Research Foundation, this new disease is fully described and illustrated by numerous photomicrographs. In it, Dr. Box also presents a full exposition of his views as to the sequence and nature of the pathologic changes leading to the development of a mature case of what has in the past been commonly called "pyorrhea alveolaris." In this presentation, he makes use of a nomenclature containing several new terms, which seem to be well suited to the designation of the condition of disease as described and as shown in the photomicrographs. Dr. Box has found that there are two distinct types of periodontal disease, or chronic periodontitis,

as he terms it. These are chronic periodontitis simplex and chronic periodontitis complex. The "complex" type is the common type and is characterized in the mature case by the formation of deep puspockets along one or more sides of the root, as contrasted with the type which produces uniform resorption of the alveolar crest. To this type he gives his main consideration in the bulletin.—Stillman and McCall, in Oral Hygiene, August, 1924.

New Health Service in Chili: Forty-one new firms of manufacturers and merchants, employing approximately 4,000 persons, have joined the Industrial Association, which is extending its usefulness by means of a complete health service, including consultations, treatments, and dental, maternity, and nursing service, created especially for employees and other persons of the middle class. The association already has a legal consultation service, savings bank, and employment bureau, and insurance, information, and investigation departments.—Child Health Magazine, September, 1924.

Pan-Pacific Research Institute: The Castle home, with 4 acres of land, one of the largest in Honolulu, and another building almost as large, is to be the home of the Pan-Pacific Scientific Research Institute. According to Science, the buildings will house, besides the permanent staff, about forty visiting research scientists. This gift will be the nucleus of the Pan-Pacific University, a graduate institution for which a charter was granted some years ago. The chief work of the research institute will be along lines of study of food resources of lands in and about the Pacific Ocean. It will not be connected with any other institution but will cooperate with kindred institutions. Scientists who, for months, have been planning the Pan-Pacific Research Institute will report at the coming conference and it is understood that the institute will begin operations at once. Dr. David Starr Jordan, chancellor emeritus of Stanford University, it is reported, has tentatively accepted the directorship of the institute.—Journal of the American Medical Association, September 13, 1924.

GENERAL

Report on Abrams Investigation: The committee appointed by the Scientific American about a year ago to investigate the so-called electronic reactions of Abrams has rendered a report. The conclusion was, in part, that "The entire Abrams electronic technic is not worthy of serious attention in any of its various forms. At best, it is all an illusion; at worst, it is a colossal fraud. The so-called electronic reactions of Abrams do not exist—at least objectively. They are merely products of the Abrams' practitioners' minds." The committee which conducted the investigation comprised Dr. William H. Park, director of the bureau of laboratories of the New York Health Department; Dr. Walter C. Alvarez, associate professor of research medicine at the George Williams Hooper Foundation of Medical Research, University of California; Robert C. Post, a civil engineer, and J. Malcolm Bird and Austin C. Lescarboura, editors of the Scientific American.—Journal of the American Medical Association, September 13, 1924.

Dentists in Preventive Medicine: For the past twenty years, certain groups of the medical and allied professions have been awakening to the great possibilities of preventive measures. The pioneers were the dentists. For many years, a few of the wiser practitioners of dentistry have instructed their patrons to come to them at regular intervals for an examination of their teeth, that they might be advised as to their proper care, and might have slight defects repaired in their incipience. More recently this custom has become almost universal in dental practice.—John M. Dodson, in Journal of Industrial Hygiene, September, 1924.

Health Facts from Lay Sources: It is just a little disgusting to us to note that so much of the literature on health and how to preserve it emanates from organizations that have few medical men connected with them, and that the propaganda distributed by such organizations has not been written by nor shows evidence of having been endorsed by medical men. It is an undeniable fact that many lay people are having much to say concerning the preservation of health, and we wonder upon what they base their competency to speak and by what authority they presume to offer suggestions and advice. We harp a good deal upon the subject of educating the public, and the subject deserves serious consideration, but aren't we a little inconsistent when we permit or sanction the dissemi-

nation of propaganda that emanates from a variety of lay sources and which in many instances is not trustworthy?—Journal of Indiana State Medical Association, August 15, 1924.

Dental Propaganda: We have in our dental propaganda to consider the two methods—physiological or radical prevention and early detection and treatment, and we would constantly bear in mind that the second method, valuable as it is, is only a patchwork method and leaves the causes quite undealt with and continuing to give rise to ill-health in many directions. The great factors governing health appear to be food, exercise, fresh air and sunlight. The two first—food and exercise—are intimately associated with the growth of the teeth and the prevention of dental caries and consequently a few words with regard to the prevention of decay of teeth may well be introduced into most general health lectures. It is, however, more especially one quality of the food and one kind of exercise that are so essential for the regular eruption and preservation of the teeth. It is therefore necessary to have teaching directed to this specific purpose. It, moreover, appears to me that propaganda for this purpose is more likely to be immediately successful than similar work for the prevention of other diseases, because the cause is so clear and effect follows fairly quickly, and the results of efforts can be shown. The cause of most disease is very complex and often dates from the remote past. For these and other reasons I look upon dental propaganda as likely to yield better results than any other form of propaganda work.—James Wheatly, in Public Health, August, 1924.

Dr. Foote Receives Honorary Degree: Creighton University, at the thirty-fourth annual commencement exercises held May 31, conferred the honorary degree of doctor of laws on James S. Foote, A.B., M.D., emeritus professor of pathology and histology of the Creighton Dental College, in recognition of his research work and his thirty years' association with the University. Dr. Foote has been engaged in research work for the American Dental Association for several years.

Army Medical and Dental Departments: The surgeon general, impressed with the increasing number of vacancies occurring in the Army medical corps and the difficulty of acquiring qualified candidates, has addressed letters to the heads of leading medical schools requesting aid in obtaining graduated students who may prove able to pass the required examination for appointment to commission. There are now forty-six vacancies. In the dental corps, there are four vacancies, and a fifth in prospect by retirement of an officer for disability. Assignments to active duty of two dental reservists were made this week, with assignment to general hospitals for the treatment of veterans' bureau patients. One is Lieutenant Martin E. Kennebec, a brother of Captain George R. Kennebec, of the regular corps, on duty in the dental division of the surgeon general's office, and who is assigned to Walter Reed Hospital; the other is Lieutenant Paul S. Wilson, assigned to the Letterman Hospital.—Army and Navy Register, September 20, 1924.

Unauthorized Dental Treatment: The basic law under which the dental corps of the Navy was established and under which naval dental activities are now carried on provides that the services of dental officers shall be available only to persons on the active list of the Navy and Marine Corps. It is anticipated that in certain instances it will be necessary, for humanitarian reasons, to undertake emergency dental treatment for persons not on the active list of the Navy and Marine Corps where there is no possibility of obtaining civilian dental service. Whenever such treatment is undertaken, a detailed statement of all of the facts of every such case shall be attached to the Form K-dental of the ship or station and forwarded via official channels to the bureau of medicine and surgery. This statement will be in the form of a special letter report by the dental officer who has performed the treatment. Rear Admiral E. R. Stitt, surgeon general of the Navy, has called the attention of all dental officers to the fact that original gold, crown, bridge, and plate restorations shall not be undertaken except as authorized at certain naval hospitals. Such procedures are, except as stated, contrary to the policy of the bureau. Pecuniary dealings of any nature between officers and enlisted men are prohibited except as specially provided by naval regulations.—Army and Navy Register.

Announcements

CALENDAR OF MEETINGS

NATIONAL SOCIETIES

American Association of Dental Schools, March, 1925, Chicago, Illinois.

American Dental Assistants' Association, November 10-14, 1924, Dallas, Texas.

American Dental Association, November 10-14, 1924, Dallas, Texas.

American Dental Trapshooters' Association, November 10, 1924, Dallas, Texas.

American Society of Dental Radiographers, November 7 and 8, 1924, Dallas, Texas.

American Society of Oral Surgeons and Exodontists, November 6-8, 1924, Adolphus Hotel, Dallas, Texas.

American Society of Orthodontists, April 14-17, 1925, Atlanta, Georgia.

Delta Sigma Delta, November 10, 1924, Jefferson Hotel, Dallas, Texas.

Dental Protective Association of the United States, December 15, 1924, 4:00 p. m., Palmer House, Chicago, Illinois.

Federation Dentaire Internationale, August 5-7, 1925, Geneva, Switzerland.

Federation of American Women Dentists, November 10-12, 1924, Dallas, Texas.

National Alumni Chapter, Psi Omega Fraternity, November 10, 1924, Southland Hotel, Dallas, Texas.

National Alumni Chapter, Xi Psi Phi Fraternity, November 10, 1924, Adolphus Hotel, Dallas, Texas.

National Association of Dental Examiners, November 10, 11, 1924, Dallas, Texas.

STATE SOCIETIES

District of Columbia, at George Washington University, Washington, D. C., second and fourth Tuesdays in each month from October to June inclusive.

National Capital at Washington, D. C., first Tuesday of every month.

November

American Dental Association, at Dallas (10, 11, 12, 13, 14).

Arizona, at Phoenix (13, 14, 15).

New York Stomatological Society, at New York City (24).

Texas, at Dallas (10, 11, 12, 13, 14).

December

Ohio, at Dayton (2, 3, 4).

January (1925)

Chicago Dental Society, Chicago (21-23).

February (1925)

Minnesota at Kenwood Armory, Minneapolis (10-13).

April (1925)

Alabama, at Mobile (8).

Connecticut, at Hartford (April 30-May 2).

Kansas, at Hutchinson (20-22).

Kentucky, at Louisville (6-8).

Michigan, at Grand Rapids.

New Jersey, at Newark (8-11).

Oklahoma, at Oklahoma City.

Virginia, at Staunton (27-29).

May (1925)

Arkansas, at Little Rock (18-20).

Illinois, at Peoria (12-14).

Indiana, at Indianapolis (18-21).

Iowa, at Des Moines (5-7).

Massachusetts, at Boston (4-8).

Missouri, at Kansas City (11-13).

Nebraska, at Omaha (third week).

New York, at Albany (13-16).

North Carolina, at Pinehurst (12-14).

North Dakota, at Fargo (first week).

Pennsylvania, at Reading (5-7).

Tennessee, at Knoxville (first week).

West Virginia, at Beckley (18-20).

June (1925)
Colorado, at Colorado Springs (18-20).
Maine, at Bangor (24-26).
South Dakota, at Watertown.
Southern California, at Los Angeles.
Utah, at Salt Lake City.
Washington, at Spokane (1).

July (1925)
Rhode Island, at Newport.

MEETINGS OF THE STATE BOARD OF DENTAL EXAMINERS

California, at San Francisco, December 6, 1924. Secretary, C. A. Herrick, 133 Geary Street, San Francisco, California.

Colorado, at Denver, December 2-6, 1924. Secretary, William H. Flint, Littleton, Colorado.

Connecticut, at Hartford, November 18-20, 1924. Recorder, Arthur B. Holmes, 43 Central Avenue, Waterbury, Connecticut.

Indiana, October 27 to November 1, 1924. Secretary, H. C. McKittrick, 1006 I. O. O. F. Building, Indianapolis, Indiana.

Iowa, at Iowa City, December 8, 1924. Secretary, C. B. Miller, 712 Equitable Building, Des Moines, Iowa.

Maryland, at Baltimore, November 11-13, 1924. Secretary, T. L. McCarriar, 1822 North Charles Street, Baltimore, Maryland.

Michigan, at Ann Arbor, November 17-22, 1924. Secretary, B. S. Sutherland, 401 Ward Building, Owosso, Michigan.

Minnesota, at University of Minnesota, November 11-19 inclusive. Secretary-Treasurer, R. B. Wilson, 1133 Lowry Building, St. Paul, Minnesota.

Nebraska, at Creighton Dental College, Omaha, November 17-22, 1924. Superintendent, J. W. Case.

Nevada, at Reno, December 8, 1924. Secretary, G. H. Marven, Reno, Nevada.

New Jersey, at Trenton, December 1, 1924. Secretary, John C. Forsyth, 429 E. State Street, Trenton, New Jersey.

North Carolina, at Raleigh, January 12, 1925. Secretary, F. L. Hunt, Asheville, North Carolina.

Oklahoma at Oklahoma City, January 5, 1925. Secretary-Treasurer, L. M. Doss, Oklahoma City, Oklahoma.

NEW JERSEY STATE DENTAL SOCIETY

A meeting of the New Jersey State Dental Society will be held in Newark, April 8-11, 1925. For further information, address

F. K. HEAZELTON, *Secretary,*
223 E. Hanover Street,
Trenton, N. J.

KENTUCKY STATE DENTAL ASSOCIATION

The fifty-sixth annual meeting of the Kentucky State Dental Association will be held at the Brown Hotel, Louisville, April 6-8, 1925.

HUGH M. MCELRATH, *President,*
Murray, Ky.
W. M. RANDALL, *Secretary,*
1035 Second Street,
Louisville, Ky.

VIRGINIA STATE DENTAL ASSOCIATION

The fifty-sixth annual meeting of the Virginia State Dental Association will be held at Staunton, Va., April 27-29, 1925; headquarters at Stonewall Jackson Hotel.

W. N. HODGKIN, *Secretary,*
Warrenton, Va.

CALIFORNIA STATE BOARD OF DENTAL EXAMINERS

The next examination by the Board of Dental Examiners of California of applicants for a license to practice dentistry in that state will be held in San Francisco, beginning Dec. 6, 1924. For further particulars, address

C. A. HERRICK, D.D.S., *Secretary,*
133 Geary Street,
San Francisco, Calif.

MINNESOTA STATE BOARD OF DENTAL EXAMINERS

The next meeting of the Minnesota State Board of Dental Examiners will be held at the College of Dentistry of the University of Minnesota, November 11-19, inclusive. All applications should be in the hands of the secretary ten days before the meeting. For further information, address

R. B. WILSON, *Sec'y-Treas.,*
1133 Lowry Building,
St. Paul, Minn.

NEBRASKA STATE DENTAL BOARD EXAMINATION

The Nebraska State Dental Board examination will be held, November 17-22, at the Creighton Dental College, Omaha. Practical work will be given the first two days and written work the last three days.

Department of Health and Welfare,
Bureau of Examining Boards
J. W. CASE, *Superintendent.*

NEVADA STATE BOARD OF DENTAL EXAMINERS

Nevada State Board of Dental Examiners will hold their next examination at Reno, beginning, Monday, Dec. 8, 1924. For further information, address

G. H. MARVEN, *Secretary,*
Reno, Nevada.

NORTH CAROLINA STATE BOARD OF DENTAL EXAMINERS

The next meeting of the North Carolina State Board of Dental Examiners will be held in Raleigh, beginning promptly at 9 a. m., Monday, Jan. 12, 1925. For further information and application blanks, address

F. L. HUNT, *Secretary,*
Asheville, N. C.

OKLAHOMA STATE BOARD OF DENTAL EXAMINERS

The next meeting of the Oklahoma State Board of Dental Examiners will be held, January 5, 1925, in Oklahoma City.

L. M. DOSS, *Sec'y-Treas.,*
American National Bank Bldg.,
Oklahoma City, Okla.

FEDERATION OF AMERICAN WOMEN DENTISTS

The Federation of American Women Dentists will hold their annual banquet at Melrose Court, Dallas, Texas, the evening of November 10. For further information, address

EDNA WARD, *Sec'y-Treas.,*
10510 Euclid Avenue,
Cleveland, Ohio.

THE NEW YORK STOMATOLOGICAL SOCIETY

The next meeting of the New York Stomatological Society will be held Monday, November 24, at 2 p. m., at 2406 University Avenue, New York City. Dr. George W. Shera will give a paper and a clinic on "Impressions with Mouth Closed Under Normal Biting Stress."

STANLEY SLOCUM, *President,*
597 Fifth Avenue.
F. W. MCDONALD, *Secretary,*
33 West Forty-Second Street,
New York City.

CHICAGO DENTAL SOCIETY AND MIDWINTER CLINIC AND MEETING

The Chicago Dental Society will hold its annual midwinter clinic and meeting at the Drake Hotel, January 21-23, 1925. The program, which is practically completed, covers all phases of dentistry, appealing to the specialist as well as to the general practitioner. Many men new to Chicago Dental Society audiences will appear in the scientific and technical sections. More exhibit space has been reserved than ever before, which insures a most comprehensive display of dental equipment and merchandise. All members of the American Dental Association are cordially invited to attend. Reduced railroad rates will be available.

M. M. PRINTZ, *Secretary,*
25 East Washington Street,
Chicago, Ill.

DENTAL PROTECTIVE ASSOCIATION

The annual meeting of the Dental Protective Association of the United States will be held at the Palmer House, State and Monroe Streets, Chicago, Monday, December 15, at 4 p. m. The report of the officers will be given; a board of directors will be elected and such other business as should come before the association be transacted. All members are urgently requested to be present. By order of the board of directors

J. G. REID, *President,*
5 South Wabash Ave.
D. M. GALLIE, *Vice-Pres.-Treas.,*
32 North State Street.
E. W. ELLIOT, *Secretary,*
39 South State Street.
Chicago, Ill.

THE AMERICAN SOCIETY OF ORTHODONTISTS

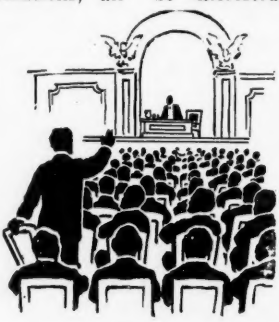
The twenty-fourth annual meeting of the American Society of Orthodontists will be held in the new Atlanta-Biltmore Hotel, Atlanta, Ga., April 14-17, 1925.

WALTER H. ELLIS, *Sec'y-Treas.,*
397 Delaware Avenue
Buffalo, N. Y.
CLINTON C. HOWARD, *President,*
Doctors' Building
Atlanta, Ga.

Has Anybody Here Ever Been in the West?

PERHAPS, then, you visited one of those tall grain elevators that line western railroads, and there you watched the operation of a machine called the "fanning mill."

You noticed that from bins high overhead the wheat came down through a chute leading onto the vibrating trays of the fanning mill. As the grains jumped and swirled with the vibrations, air from a revolving fan removed the sticks, hulls and other chaff, and left only the clean grains of wheat ready for the miller's use.



Did these thoughts occur to you? Suppose there were no such machine as a fanning mill! Suppose each of the particles of chaff had to be picked out by hand! What a laborious task! How it would add to the cost of each bushel of grain and to that of each barrel of flour! What a factor is the fanning mill in the cost of bread, cereal and pastry, which goes on the family table!

Modern life is one of intricacies, indeed. There are so many elements contributing to it that we do not realize their individual importance. *For instance, few of us consider the importance of advertising and the similarity of its work to that of the fanning mill.*

* * * *

Advertising is a commercial and marketing force that influences our food, sleep, pleasure and labor.

It separates the chaff from the grain—separates those who are not interested and who could not be interested, leaving the buyers and possible buyers. The separation, like that of the fanning mill, is done in volume at the minimum of cost.

Advertising costs are unimportant in comparison with the results — just as the cost of a fanning mill is negligible when compared to the saving it effects in the process of separating chaff from wheat.

The modern manufacturer uses advertising to reduce his selling costs. It helps him keep down the selling price to his customers.

That is why we see so many manufacturers of products used in the *dental* field advertising in *The Journal of the American Dental Association.*